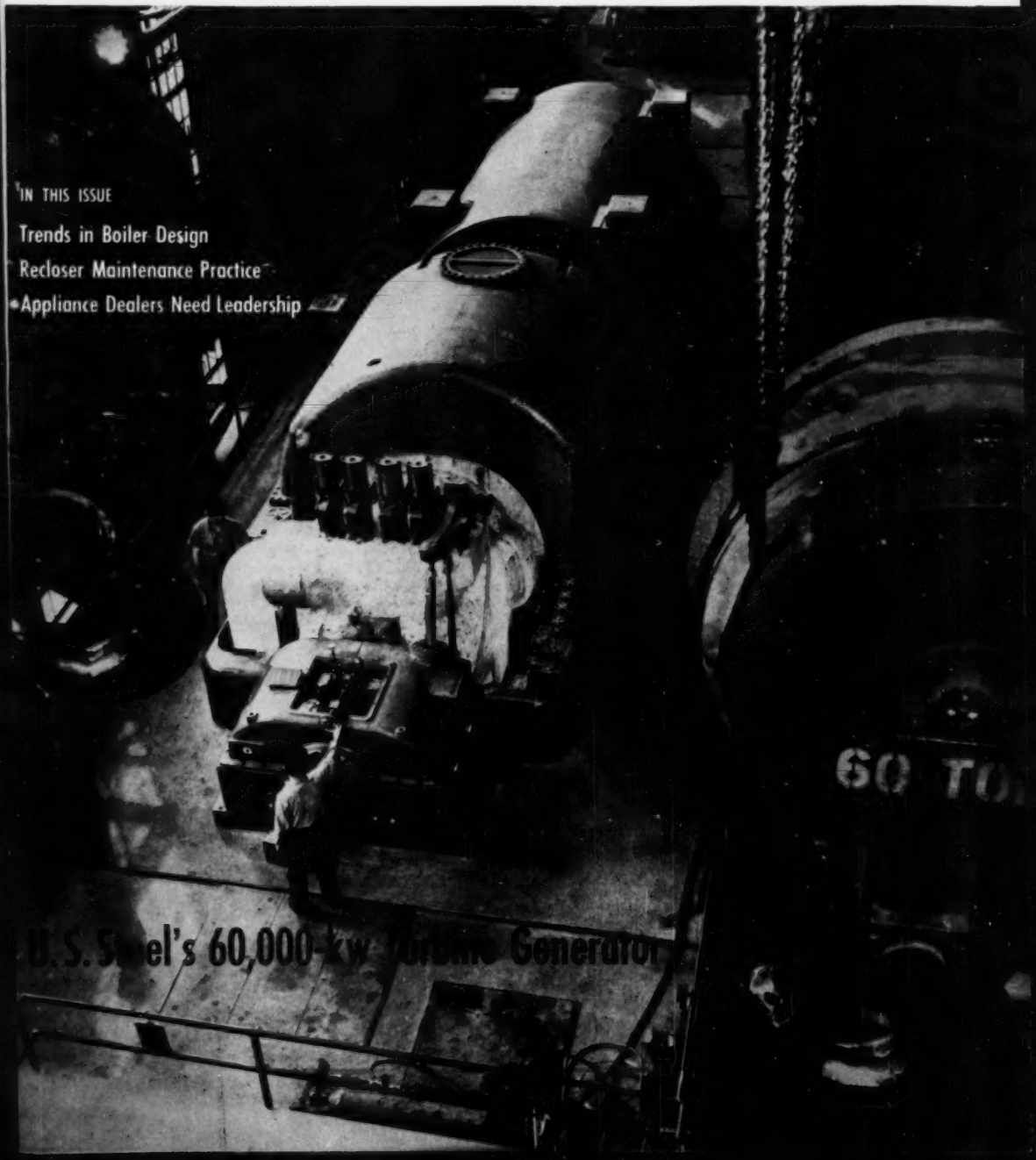
JULY 28, 1952

FOR THIS WEEK'S NEWS—SEE PAGE 69

Electrical World

Price 35 Cents

A McGRAW-HILL PUBLICATION

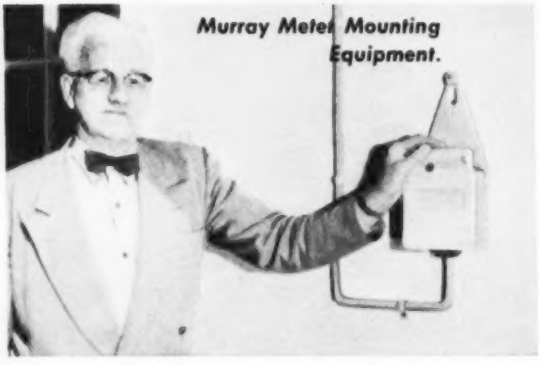


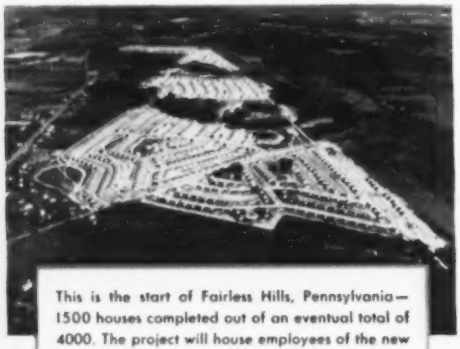
U.S. Steel's 60,000-kw Turbine Generator

Electrical Contractor on Fairless Hills Project tells why he likes MURRAY EQUIPMENT

Murray Main and Range Service Equipment.

John A. Humble, electrical contractor, President of Humble's Electric Company, Girard, Ohio, who is now working on 4000 new homes at Fairless Hills, Pennsylvania, has this to say about Murray equipment: "I like Murray because their boxes go up easy and there's plenty of wiring room. Those things are important on any job and *real* important on a job like this. A difference of only 5 minutes in wiring one piece of equipment, for instance, amounts to about 333 hours, when you figure on 4000 houses." Murray is supplying all meter mountings and a good percentage of main and range equipment on this job.


Murray Meter Mounting Equipment.



This is the start of Fairless Hills, Pennsylvania—1500 houses completed out of an eventual total of 4000. The project will house employees of the new U. S. Steel mill to be built in nearby Morrisville, Pennsylvania. Modern electrical appliances play an important part in this project. Each house is equipped with an electric range, a garbage disposal unit and an automatic washer.

MURRAY CAN SUPPLY **BOTH**

METER MOUNTING AND SERVICE ENTRANCE EQUIPMENT

For a few homes—or thousands—Murray companion equipment will make the job easier. Companion equipment is easier to wire and easier to install because the units are designed to fit together. Companion equipment looks neater, too. That's why contractors—whether working on a bungalow or a huge development, like to buy and install Murray Combination units. They're designed to fit together.

"That's what I mean by plenty of wiring room—

My men like the Murray equipment and they do a neater and faster wiring job because of it."

Murray®

MURRAY MANUFACTURING CORPORATION

1250 Atlantic Avenue, Brooklyn 16, New York

Service Entrance & Meter Equipment • Fully Magnetic Circuit Breakers • Switches (Types A, C & D) • Current Limiting Reactors • Crows'nest Aerial Ladders

WAKING UP TO HOME LIGHTING

For quite a few years lighting has been the neglected child in the family of electric services in the home.

Since the war, appliances have dominated the picture. There've been organized programs to promote electric cooking, electric water heating, electric this, and electric that. But no significant promotion of home lighting has been done since the pre-war days of the IES lamp.

There isn't any such promotion now, not in the sense of "Come on, boys! Let's all get together and push."

But there is a growing realization among electric utilities that the home lighting load, left alone for so many years to get along as best it could, has quite a few endearing qualities.

A lot more people can be persuaded to use a little more electricity for lighting than can be induced to use a lot more by the purchase of, for instance, water heaters. And that little more used by a lot more people has a much more invigorating effect on revenue because it is mostly billed on the first steps of rate schedules.

With its finger on the pulse of industry, Electrical World knew, of course, that the utilities were waking up to the potentialities of home lighting. The editors decided to find out how nearly complete the awakening was.

So they made a survey, as editors love to do.

We're not going to tell you here what the results of the survey are, because then you wouldn't feel it necessary to watch for the August 11 issue. Besides, it would be an awful tough job to compress a 16-page report into the space remaining in this column.

But we can hint at what the report contains. It's full of information on how many utilities are doing what and how they are doing it in promotion of home lighting. And — Whisper! — the report shows that apparently most utilities are going it blind in such promotion; they don't know what they're getting for what it's costing them. So they're not entirely awake yet.

AN EDUCATOR HONORED

Next week many readers will recognize the man on the cover. At least a lot of Cornell men will recognize Dr Everett Strong as one of their old professors. And many non-Cornell men will recognize him as a great educator and a great leader in the Illuminating Engineering Society of which he will soon be president.

Electrical World

Published for 78 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

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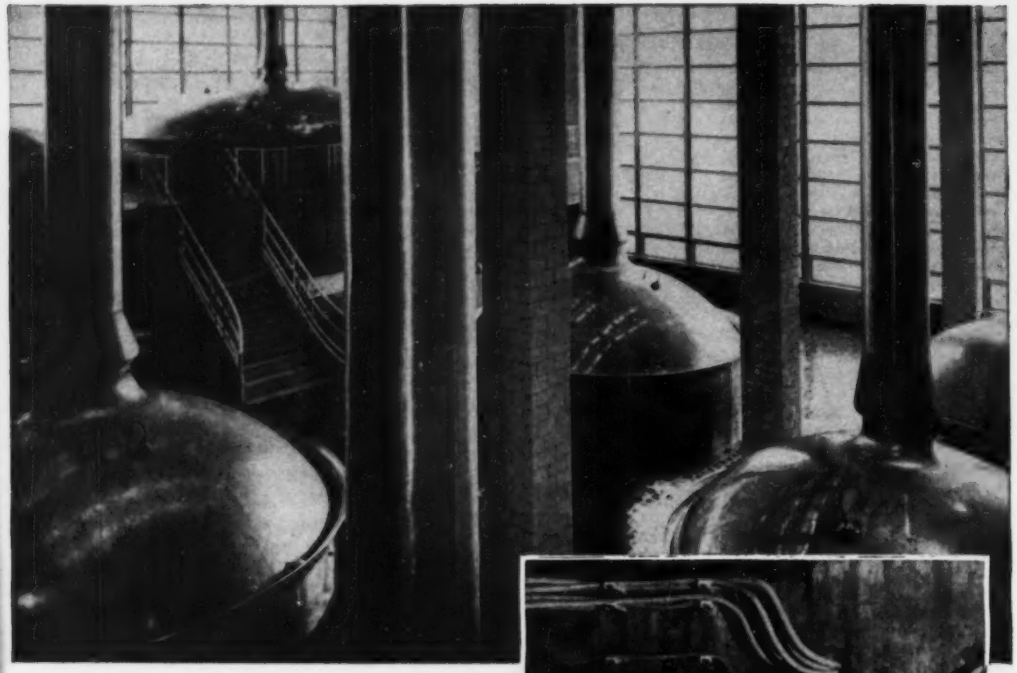
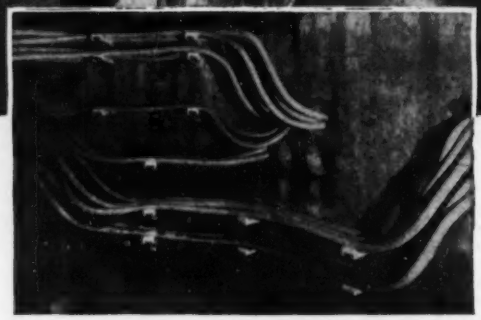


they use the best of everything at

Anheuser-Busch



Famous the world over for its fine quality, Budweiser Beer is carefully and expertly brewed from the very choicest ingredients. Of equal importance are the equipment and techniques used; and so, throughout the entire brewing cycle, Anheuser-Busch leaves nothing to chance.

In keeping with this policy, Anheuser-Busch's new brewery at Newark, N. J., uses Okolite-Okoprene cable throughout for primary and distribution feeders. Since an uninterrupted power supply is an important factor in maintaining the famed Budweiser quality, only the best electrical cables will do — Okolite-Okoprene cables.

It's the doubly durable combination of Okolite insulation and Okoprene sheath which makes these cables the No. 1 choice for electrical circuits which must not fail. The Okolite insulation provides maximum dielectric strength; the Okoprene sheath is impervious to moisture, heat, sunlight, weather, and most oils, acids and alkalies. Together, insulation and sheath applied by Okonite's strip process provide the circuit security which cannot be obtained by conventional methods of cable manufacture.

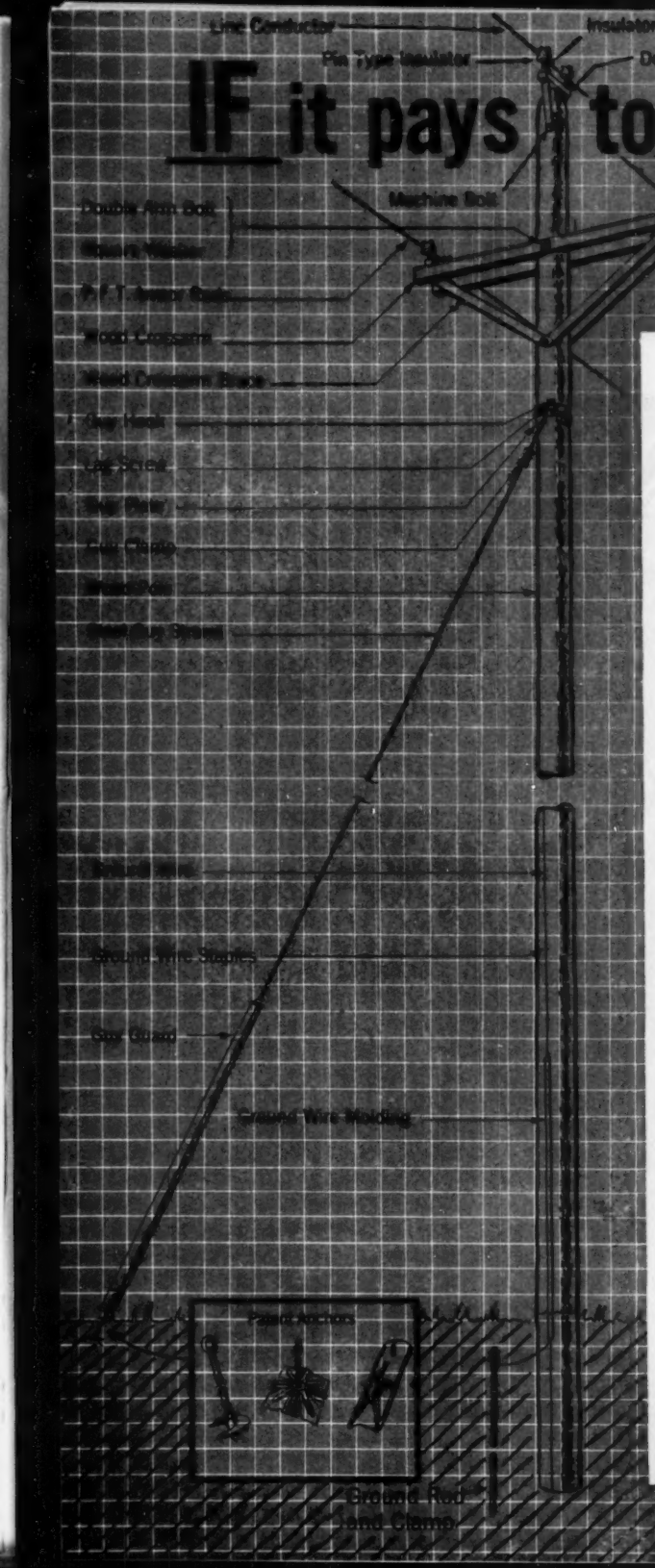
The research and engineering which go into all Okonite cables, the extremely high test voltages, the unusual and exclusive manufacturing techniques, will interest every engineer. You'll find it all in Bulletin EW-1053. The Okonite Company, Passaic, N. J.

The best cable is your best policy

OKONITE OKONITE SINCE 1878 ***insulated wires and cables***

1109

IF it pays to standardize construction



...it pays to standardize on Graybar

It's no secret that you save time and expense through standardization of pole-line construction practice. But, are you aware of the *additional* savings you can make with Graybar as a standard source for all your pole-line supplies?

From Graybar you can order everything required for any pole-line construction or maintenance project—"from the top of the pole to the bottom of the hole." You eliminate the expense of individual inquiries and orders... you get dependable items made by manufacturers you know and respect.

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In addition, experienced Graybar Outside Construction Specialists are on call to help you solve unusual problems in planning any distribution or transmission facility. *Graybar Electric Co., Inc. Executive offices: Graybar Building, New York 17, N. Y.* 234-97

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Introducing MINI

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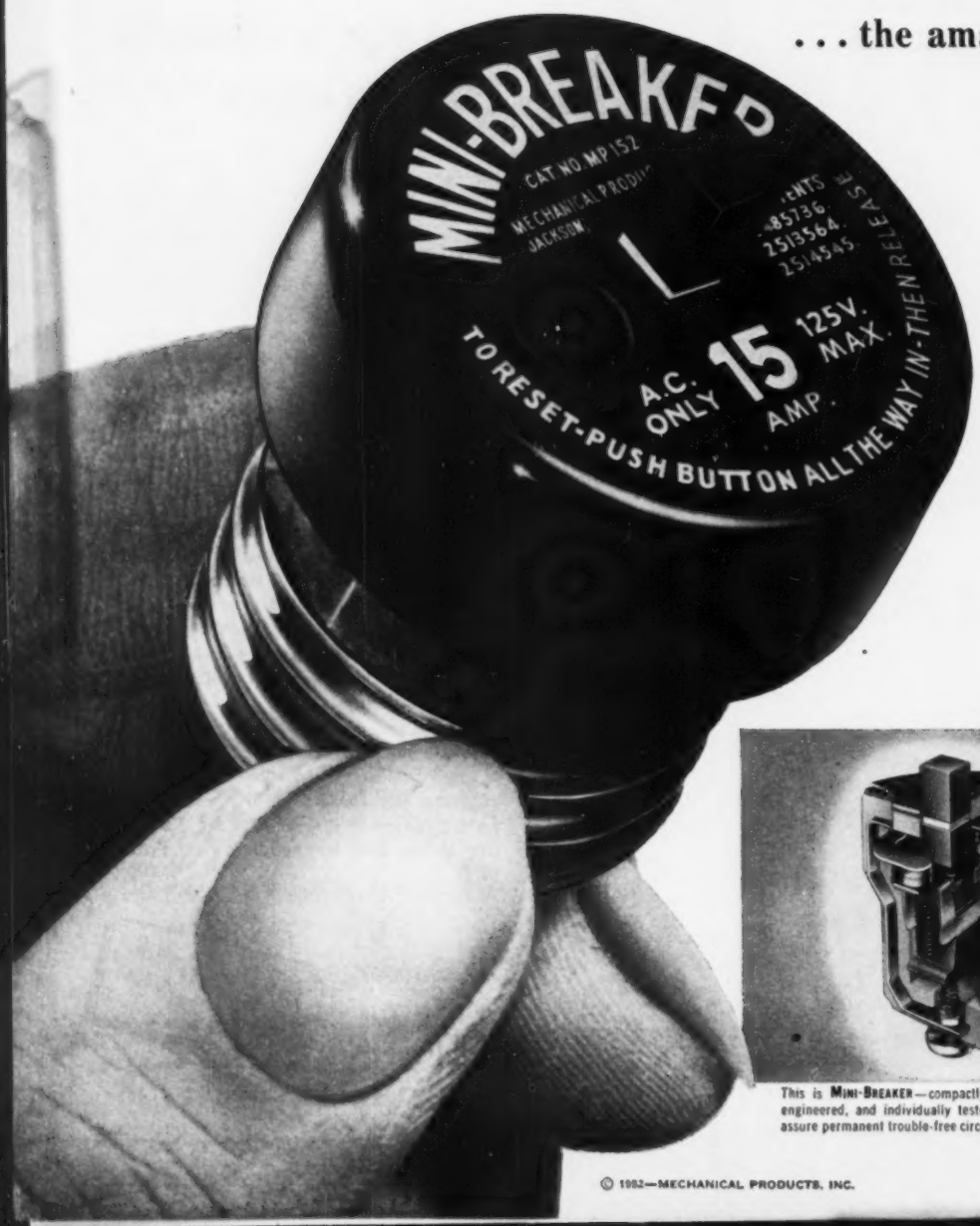

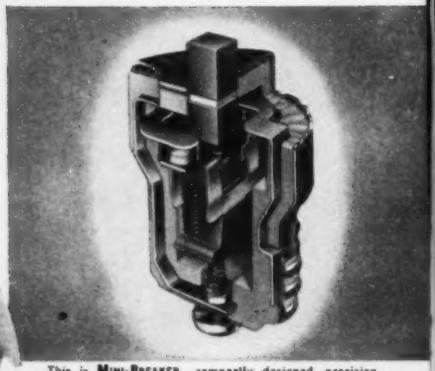

This is **MINI-BREAKER**—compactly designed, precision engineered, and individually tested after assembly to assure permanent trouble-free circuit breaker protection!

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-BREAKER®

new miniature circuit breaker that fits like a fuse in any standard plug-type fuseholder!

NEVER before has there been a circuit protective device quite like the amazing new MINI-BREAKER. Because here, for the first time, is a *thoroughly tested* miniature branch circuit breaker that can actually be used as a *direct replacement* for expendable plug-type fuses! Installed by anyone in a matter of seconds in any standard Edison base fuse receptacle. Used with confidence, too, wherever 15, 20 and 30 ampere circuits exist for 110-125 volt a-c service. For although many attempts have been made to develop just such a practical low-cost device, MINI-BREAKER is the first and only product of its kind ever to meet the requirements specified for listing as a "Circuit Breaker-Miscellaneous" by Underwriters' Laboratories, Inc. And, when commercially available, it will bear the Re-examination Service marker.

Anyone can install a MINI-BREAKER in seconds! And anyone can restore electrical service simply by pressing and releasing the reset button!

Provides Permanent, Positive Protection Against Overloads and Short Circuits!

Yes, in spite of its compact size and its basic resemblance to the fuse it is designed to replace, MINI-BREAKER is a full-fledged circuit breaker in every sense of the term. A precision built assembly of carefully selected, perfectly balanced parts . . . all permanently protected and enclosed within a durable insulating case.

In operation, MINI-BREAKER safely interrupts excessive overloads and short circuits . . . tripping instantly on "shorts", but with a built-in time lag for handling temporary starting loads and line surges. Whenever an interruption occurs, service can easily be restored by anyone . . . normally within 10 seconds . . . simply by pressing in and releasing the reset button. Yet, in spite of its quick recovery, MINI-BREAKER is 100% trip-free. That is, it positively will not maintain a circuit that has not been cleared of the condition that caused the interruption.

What's more, while MINI-BREAKER is a thermally actuated breaker, it's virtually uneffected by the changes in ambient temperatures encountered under normal installation conditions. Because, although designed exclusively for ordinary residential, commercial, and industrial service, MINI-BREAKER actually meets and exceeds the temperature extreme conditions required for approval for aircraft use. MINI-BREAKER trips at 200% load within four minutes at −50°F., carries rated current continuously at 135°F.!

What can MINI-BREAKER *do for an Electric Utility?* Plenty! Just count the number of fuse-protected circuits on your lines today. Add the needless cost and inconvenience . . . to you or your customers . . . in replacing blown out fuses. Then project the increased revenue that would result if all those customers were to convert all those circuits to permanent, low-cost MINI-BREAKER installations! A worthwhile project, you'll agree. And we're ready to help you start it . . . *NOW!*

MECHANICAL PRODUCTS, INC.

1824 River Street • P. O. Box 116 • Jackson, Michigan

Want More Information on MINI-BREAKER? Regardless of what your interests may be, we'd like to tell you more about MINI-BREAKER. A request on your company letterhead . . . or the coupon below . . . will bring you complete details by return mail.

MECHANICAL PRODUCTS, INC.—Dept. 101

Gentlemen:

Please send me the complete MINI-BREAKER story at once!

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NO OTHER high temperature textile insulating
material saves space like FIBERGLAS YARNS!
THE NAME OWENS CORNING FIBERGLAS IS A

IF YOU MAKE OR USE

ELECTRICAL EQUIPMENT

IT WILL PAY YOU TO SPECIFY

FIBERGLAS* *insulating materials*

The size of most electrical equipment is largely controlled by the thickness of insulation required for efficient or safe operation. Effective electrical insulating materials permit the design of smaller sized electrical equipment which will deliver efficient service.

That's why, today, more and more makers and users of electrical equipment are specifying Fiberglas yarns in space-saving insulating materials.

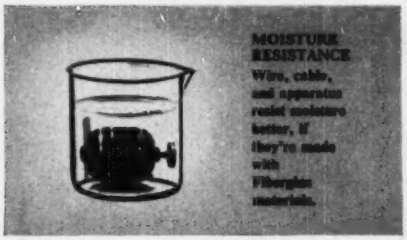
Insulating materials made with Fiberglas yarns combine exceptional strength with minimum bulk and, in addition, have higher thermal conductivity than conventional yarn insulations; thus permitting the design of smaller, lighter, high temperature electrical equipment.

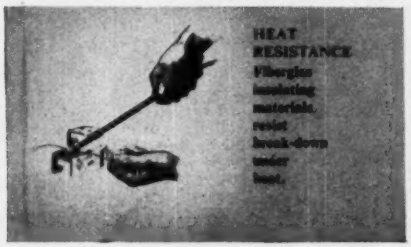
For example, Fiberglas-braided wires or cables can be as much as ⅓ less in diameter than conventional products. Fiberglas tapes, varnished cloths, sleeving and tubing, cords and laminates, as used in electrical apparatus, save space . . . deliver top service far longer than conventional materials.

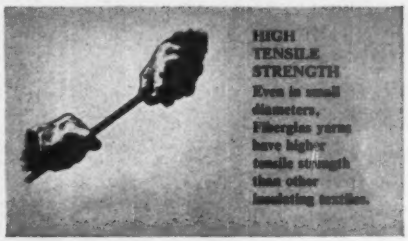
So, if you're a maker or user of electrical equipment, remember to specify FIBERGLAS.

Owens-Corning Fiberglas Corporation, Electrical Sales Division, Department 858, 16 East 56th Street, New York 22, New York.

FIBERGLAS YARNS ALSO GIVE YOU THESE COST-SAVING ADVANTAGES






HIGH TENSILE STRENGTH
Even in small diameters, Fiberglas yarns have higher tensile strength than other insulating textiles.

GOOD GUIDE TO A GOOD BUY!

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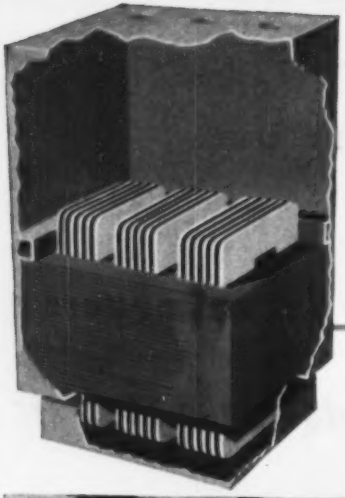

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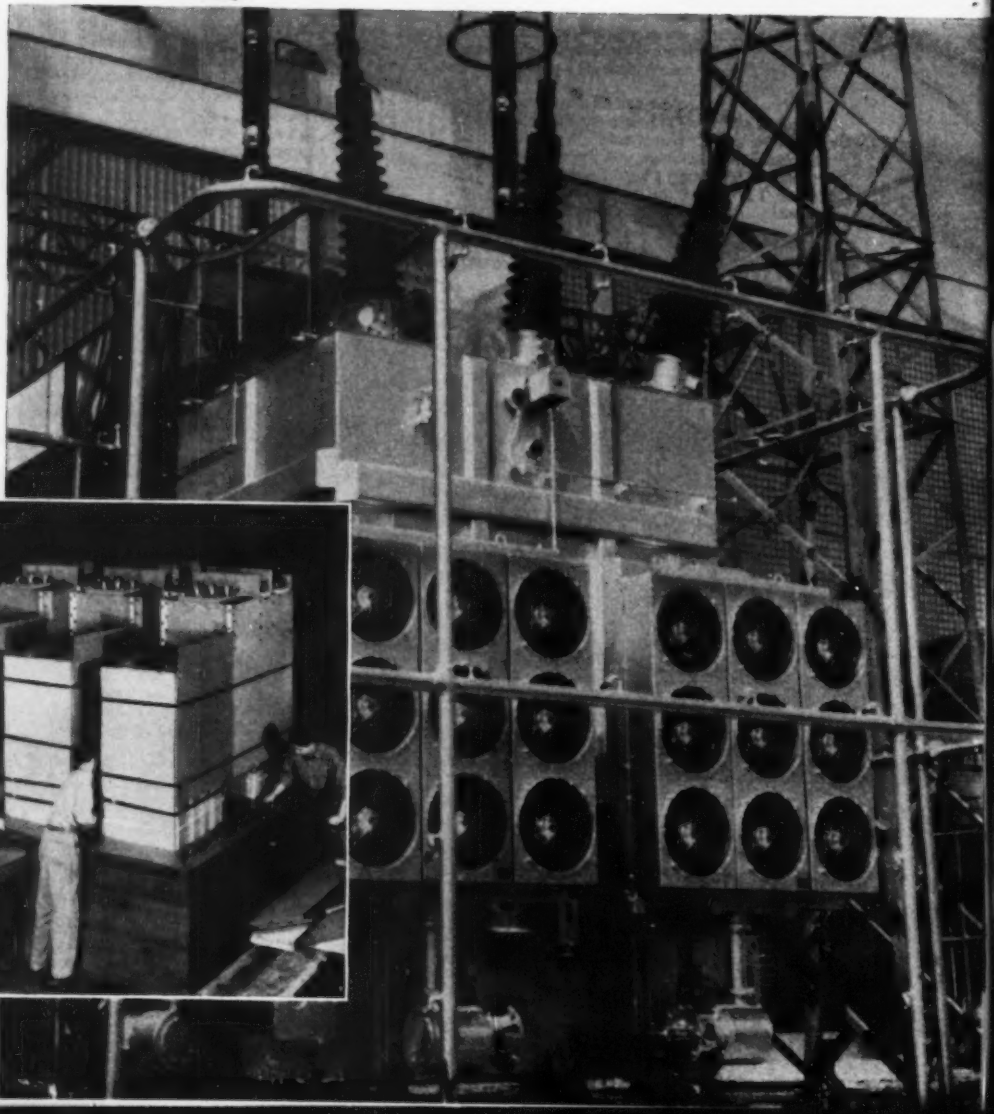

knocks big figures off installation cost

When you figure *installed cost,* a Westinghouse Form-Fit Power Transformer shows substantial capital savings.

It's easier for your crews to handle; get on the line faster. Over-all dimensions are considerably smaller than comparable ratings in other designs. Weight is correspondingly lower, too. This leads to worth-while savings in both foundation and overhead structures.

The Form-Fit case clamps the core, and the core, in turn, surrounds, supports and protects the coils. This compact and sturdy construction permits a transformer to be transported to your site on its side when shipping clearances would otherwise require disassembly. Or it may be tilted at any angle to facilitate installation. This rugged construction means less danger of damage through accidental mishandling; gives added assurance that the quality built into the transformer will reach your site intact.

When you need greater transformer capacity installed on schedule at lowest capital cost, check Westinghouse Form-Fit Power Transformers. Your Westinghouse representative will be glad to give you further information, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Penna. J-70626

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3-phase 60 cycle FOA
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Many new B&W boilers are under construction and on order to supply steam requirements for several million kilowatts of new generating capacity.

POWER FOR AMERICA

Keeping pace with the electric companies' far-sighted expansion program, The Babcock & Wilcox Company is completing this year a multi-million-dollar increase in facilities for the manufacture of steam generating equipment.

Two new plants are already in production at Wilmington, N. C. and West Point, Miss. A third one is being built at Paris, Texas. Thousands of additional employees have been trained to man these new plants, and to work expanded fabricating facilities at five other B&W plants. New machines and processes . . . including the world's largest boiler plate press . . . are setting new standards of production efficiency and speed.

B&W's expansion program parallels the electric companies' long-range planning for new generating capacity and reflects B&W's confidence in the future of America's vital power industry.

BABCOCK & WILCOX

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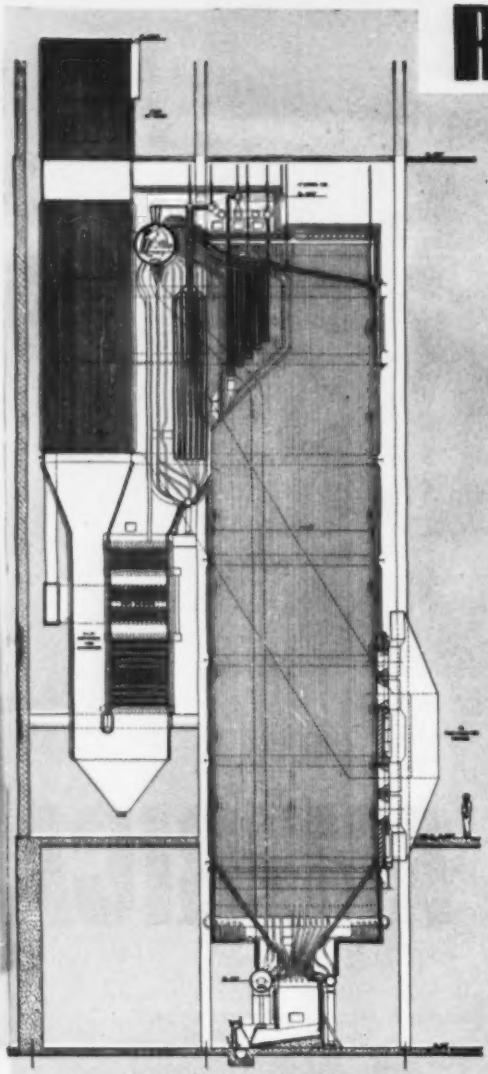
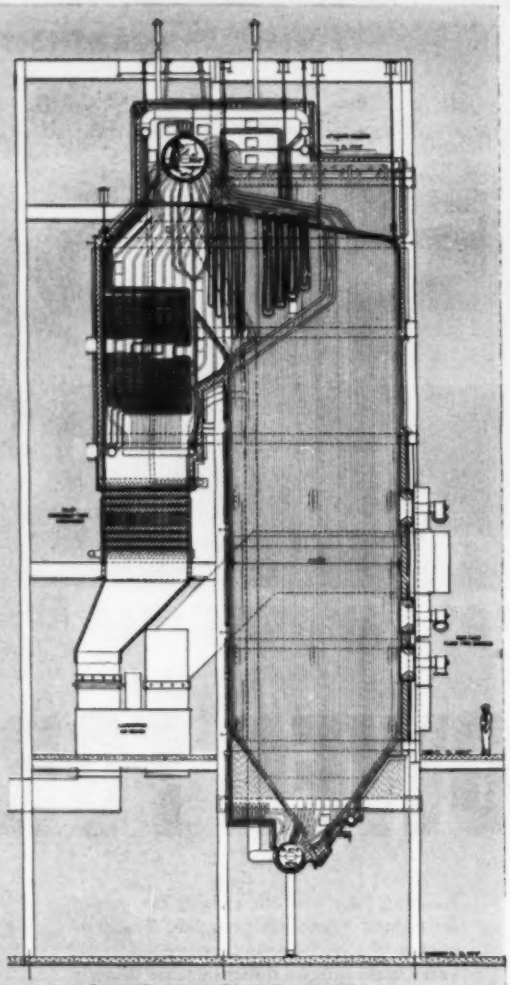


CENTRAL ILLINOIS LIGHT COMPANY
R. S. Wallace Station, Peoria, Illinois
600,000 lbs./hr. 950 psig 900°F.
This is the fifth Riley unit at this station.



SOUTH CAROLINA GAS & ELECTRIC COMPANY
Plant Hagood, Charleston, South Carolina
400,000 lbs./hr 1475 psig 955°F.
This is the third Riley unit at this plant.

RILEY

STOKER CORPORATION, WORCESTER, MASS.

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Cincinnati · Charlotte · Atlanta · New Orleans · St. Louis · Kansas City · St. Paul · Tulsa · Houston
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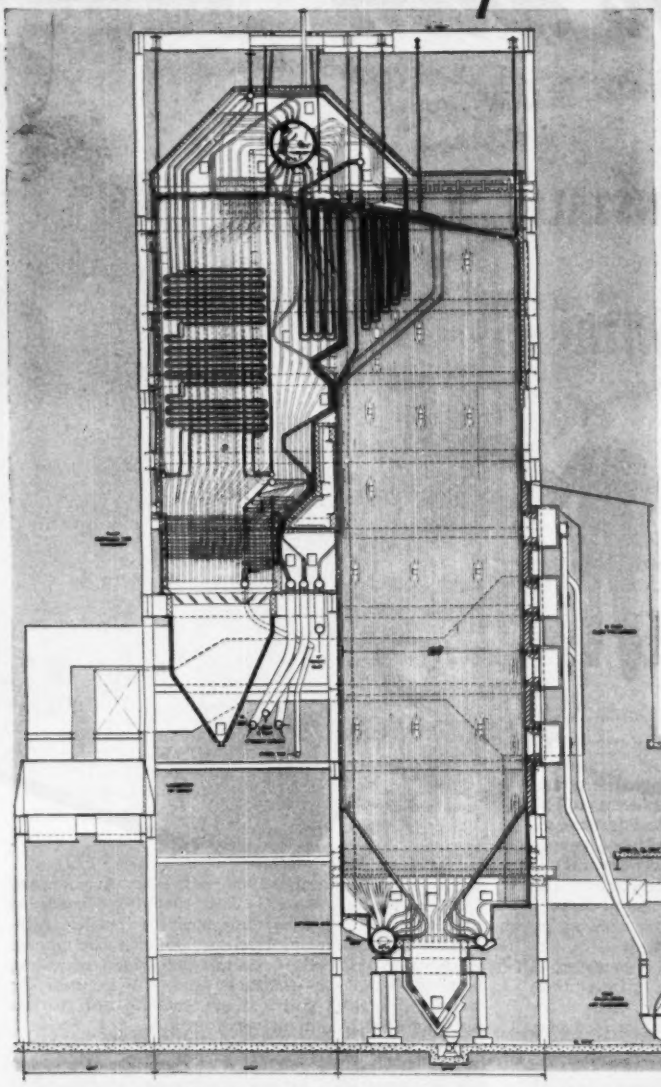
Public Utility Installations



Houston Lighting & Power Company

Deepwater Station	1—	1,300,000 lbs./hr.
West Junction Station	2—	825,000 lbs./hr.
West Junction Station	2—	400,000 lbs./hr.
Greens Bayou Station	2—	675,000 lbs./hr.
Gable Street Station	1—	350,000 lbs./hr.
Gable Street Station	1—	250,000 lbs./hr.
Gable Street Station	1—	140,000 lbs./hr.

The Potomac Edison Company

Albright Station	1—	700,000 lbs./hr.

Utah Power & Light Company

Hale Station	1—	450,000 lbs./hr.
Gadsby Station	1—	620,000 lbs./hr.
Gadsby Station	1—	575,000 lbs./hr.

Iowa-Illinois Gas & Electric Company

Riverside Station	3—	250,000 lbs./hr.
Moline Station	1—	250,000 lbs./hr.
Moline Station	2—	200,000 lbs./hr.

Iowa Electric Light & Power Company

Marshalltown Station	2—	300,000 lbs./hr.
Boone Station	1—	275,000 lbs./hr.

Monongahela Power Company

Albright Station	1—	700,000 lbs./hr.

Northern States Power Company

Granite Falls Station	1—	385,000 lbs./hr.

Public Service Company of Indiana

Edwardsport Station	3—	400,000 lbs./hr.
Noblesville Station	3—	300,000 lbs./hr.
Dresser Station	1—	300,000 lbs./hr.

South Carolina Gas & Electric Company

Plant Hagood	1—	400,000 lbs./hr.
Plant Hagood	2—	230,000 lbs./hr.

Central Illinois Light Company

R. S. Wallace Station	1—	600,000 lbs./hr.
R. S. Wallace Station	4—	300,000 lbs./hr.

Gulf Power Company

Pensacola Station	1—	325,000 lbs./hr.
Pensacola Station	2—	230,000 lbs./hr.

City of Los Angeles

Harbor Steam Station	3—	825,000 lbs./hr.
Harbor Steam Station	2—	675,000 lbs./hr.

Southwestern Gas & Electric Company

Cherokee—Texas	1—	630,000 lbs./hr.

Arkansas Power & Light Company

Cecil Lynch Station	1—	650,000 lbs./hr.

Utah Power & Light Company
Gadsby Station
Salt Lake City, Utah
575,000 lbs./hr. 1700 psig 1000°F. Reheat 1000°F.

This is the second Riley unit at this station. Utah Power & Light Co. have ordered five Riley units.

A survey of your Power Plant by a consulting engineer will possibly show ways of making surprisingly large savings in your power costs

COMPLETE STEAM GENERATING UNITS

. . . it will pay you to visit modern Riley Installations before purchasing Boiler or Fuel Burning Equipment

WATER-COOLED FURNACES · STEEL-CLAD INSULATED SETTINGS · AIR HEATERS

First with Super-

ALLIS-CHALMERS INSTALLS STEAM TURBINE GENERATOR UNIT WITH SUPERCHARGED HYDROGEN COOLING

SUPERCHARGED HYDROGEN COOLING—the greatest advance yet made in turbine-generator design—is here *now*. This 60,000 kw unit is installed and running at the Edgewater station, Sheboygan, of the Wisconsin Power & Light Company.

Allis-Chalmers is first to develop and apply the principle of directly cooling the conductors with high velocity gas. This unit is the pioneer of a new design trend. Following operating experience, the utility ordered two more similar units, with reheat, for its new Rock River station.

As compared to the 35 percent output gain hydrogen cooling gives over air cooling, supercharged hydrogen cooling increases generator ratings *70 percent* over ordinary hydrogen cooling. Significant gains are made in increasing light load efficiencies and decreasing foundation and building requirements!

The Edgewater turbine has these outstanding features:

Hydraulic control and operation with accessible placement of main stop valve; centralized grouping of operating controls; shaft-driven centrifugal pump simplifying location of oil tank; cam-operated inlet valves accessibly located on top of cylinder, and exclusive A-C method of temperature compensation for horizontal *and* vertical thermal movement.

All oil piping is above the floor, simplifying foundation and installation. And, as throughout the complete Allis-Chalmers line — ranging from the smallest single cylinder machines to single shaft, tandem compound, condensing units of 150,000 kw — labyrinth steam seals are used. The steam sealed gland system is self-contained, and provides operational safety with minimum attention.

You get the real design advances *first* from Allis-Chalmers. When planning the installation or expansion of a steam-electric power plant, let A-C simplify your problem. This *one* source will provide you with the world's widest range of power plant equipment. Bulletin 03B6801A on standardized steam turbine units and other literature on all products listed are available. For your copies, call your nearest A-C office or write to Allis-Chalmers, Milwaukee 1, Wis.

A-3445

ALLIS-CHALMERS

A-C ALLIS-CHALMERS

World's Widest Range of Power Plant Equipment

TURBINES & GENERATORS | CONDENSERS & PUMPS | SWITCHGEAR & BREAKERS | MOTORS & CONTROL | TRANSFORMERS | WATER CONDITIONING

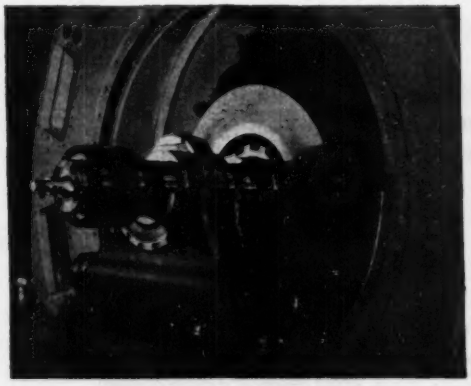
Charged Cooling!

Other ALLIS-CHALMERS FIRSTS

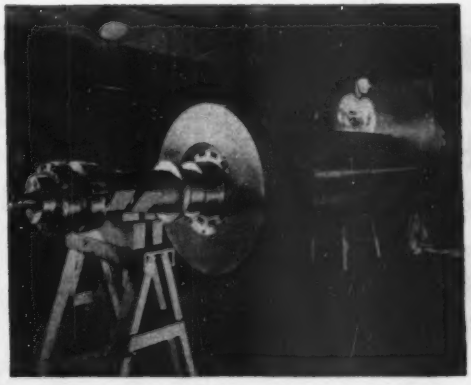
Simplified hydrogen seal and control
World's lowest exhaust pressure steam turbines
Solidly-bolted-down steam end pedestal
Turbine for one-boiler-per-turbine arrangement
"Walk-in" exciter housing
30,000 Kw, 825 F turbine, in 1931
825 F reheat turbine, in 1935

AND NOW . . . **First with supercharged hydrogen cooling!**

This 60,000 kw, 3600 rpm AIEE-ASME preferred standard unit is driven by an Allis-Chalmers tandem compound steam turbine. Steam conditions are 1250 psig, 950 F, 1½ in. Hg abs exhaust. The Edgewater station consists of this and two Allis-Chalmers 30,000 kw units.

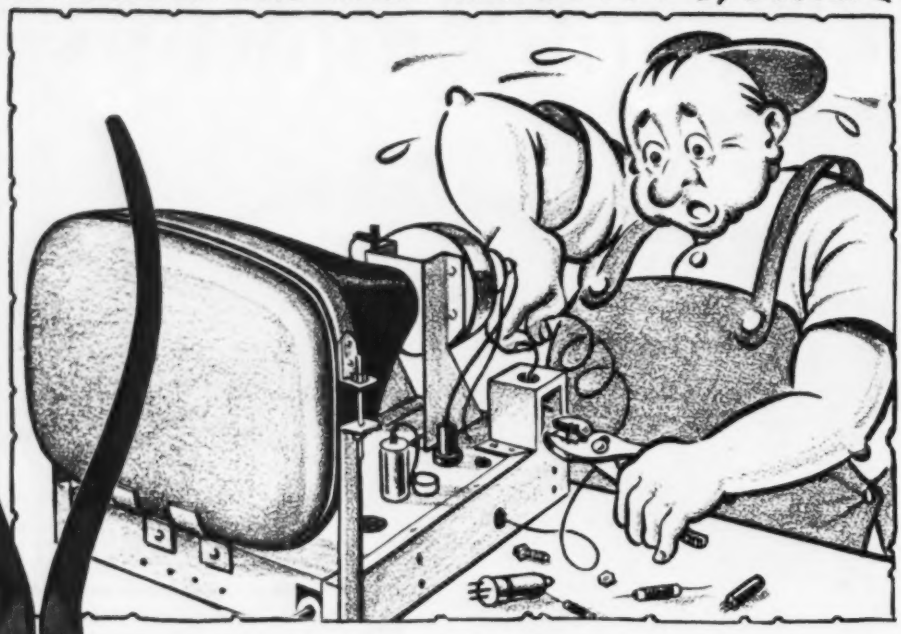


Twenty years of Allis-Chalmers blower experience aided in the design of the new rotor ventilating system. The two stage centrifugal compressor at the exciter end of the rotor "supercharges" the hydrogen to several times the pressure obtained from the usual cooling fans. Its output is cooled separately and directed into the rotor from both ends.



Shop view of rotor during construction. Instead of being sent to vent ducts in the rotor teeth, the hydrogen is directed *through* the rotor conductors. The gas is in intimate contact with the copper right where the heat originates. This improved ventilation permits a reduction in unit length and consequent reduced building space requirements.

WHY DO IT THE HARD WAY? . . . . by BUSTER



There's a CRESTOLOY PLIER for EVERY JOB

No. 654, Crestoloy Long Nose, Side Cutting Pliers. Ideal for telephone, electronic and fine electrical work.

Crescent makes 17 different patterns, 27 sizes, of Crestoloy Pliers to provide the *proper tool* for almost every conceivable plier job. Forged from special "Crestoloy" Steel, every single one of these fine tools is individually tested before it leaves the factory. Your Hardware Dealer or Industrial Distributor will help you select the proper type for your job.

FREE BOOK!

Has all the answers. It tells what tools to use and how to use them. Fully illustrated. A postcard will bring it to you. Send today.

Crescent is our trade mark, registered in the United States and abroad, for wrenches and other tools. Sold by leading distributors and retailers everywhere and made only by

CRESCENT TOOL COMPANY, JAMESTOWN, NEW YORK

NEW LOAD PICKUP SECTIONALIZER SOLVES PROBLEM OF RE-ENERGIZING HEAVILY LOADED FEEDERS

Continued load growth and increasing use of automatically controlled motor loads present serious problems of re-energizing feeders after extended outages. The new Westinghouse "LPS" (Load Pickup) Sectionalizer offers a permanent solution to this growing problem on radial distribution feeders.

Operation on Extended Outages

Loss of diversity, and inrush currents after extended outages operate the station breaker through its tripping sequence. The "LPS" counts the pulses of overload current created by the opening and closing of the breaker—it opens during the third open-circuit time, dropping its portion of the load. Control voltage (110 volts) from the line side of the "LPS" operates its relays to close the "LPS" after an adjustable time delay, picking up the remainder of the load.

Automatically picking up the distribution system in sections reduces the maximum inrush current, permitting low, and thus more sensitive relay settings.

Operation on Faults

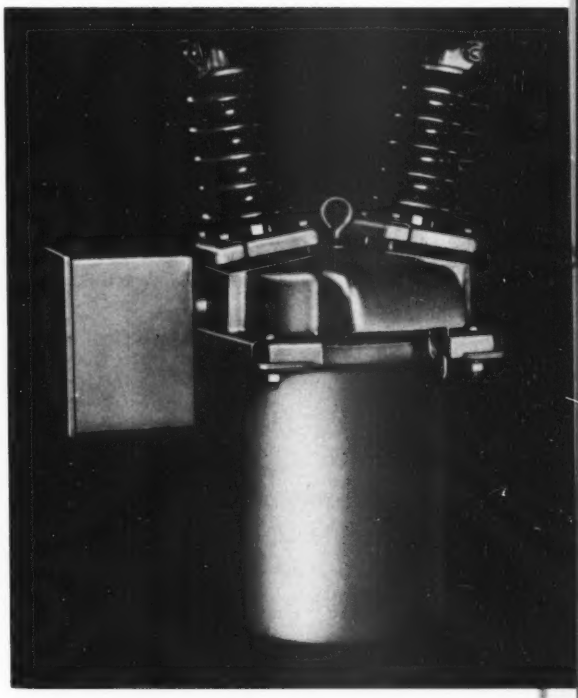
The "LPS" sectionalizer also has the desirable feature of being able to sectionalize the load it controls, should a permanent fault occur in that area. A fault at "X" operates the station breaker through its tripping sequence. The "LPS" counts the pulses of fault current and opens during the third open-circuit time, disconnecting the faulted portion of the system. The mechanical trip-free mechanism in the "LPS" prevents the control voltage from closing it on the fault until reset by the lineman.

A Versatile New Tool for Your Distribution System

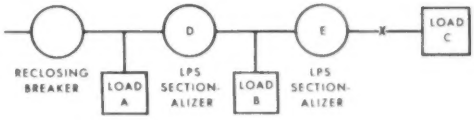
The "LPS" control relay has adjustable pickup times of two to thirty minutes. The fault counting sequence may be varied from one to three counts. Control voltages of 110, 220, and 460 volts are available.

Three "LPS" sectionalizers may be secured, mounted and wired on a channel for three-phase installations.

For complete information on the new Westinghouse "LPS" sectionalizer, write Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30, Pennsylvania.

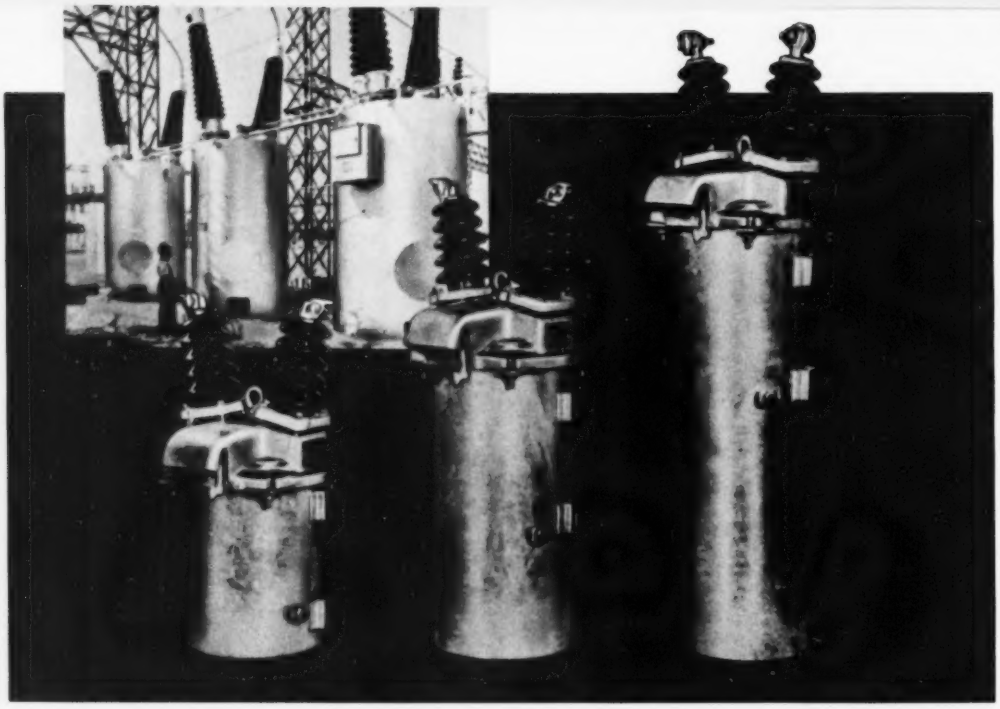


Type "LPS" Load Pickup Sectionalizer.



Typical application of "LPS" Load Pickup Sectionalizers. "LPS" at point E would be set to add Load C to system after Loads A and B have regained diversity.

YOU CAN BE SURE...IF IT'S
Westinghouse
DISTRIBUTION APPARATUS



GRS SECTIONALIZER—15 kv, 5 to 100 amperes, 6,500-ampere max. momentary rating.

50-GR RECLOSER—15 kv, 5 to 50 amperes, 1,200-ampere max. int. rating.

100-GR RECLOSER—15 kv, 25 to 100 amperes, 2,500-ampere max. int. rating.

"BIG BREAKER" ENGINEERING BACKS WESTINGHOUSE RECLOSER AND SECTIONALIZER DESIGNS

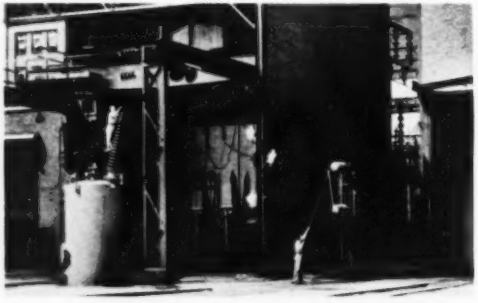
Westinghouse Reclosers and Sectionalizers are fundamentally small oil circuit breakers. Knowledge gained from years of experience in designing, building, and testing big breakers—with interrupting capacity of 10,000,000 kva and higher—has been applied to the development of Westinghouse Reclosers and Sectionalizers.

This knowledge covers the efficient interruption of fault current under oil—adequate internal insulation co-ordinated with bushing insulation—other important factors such as time sequence and surge protection.

High Power Laboratory Testing

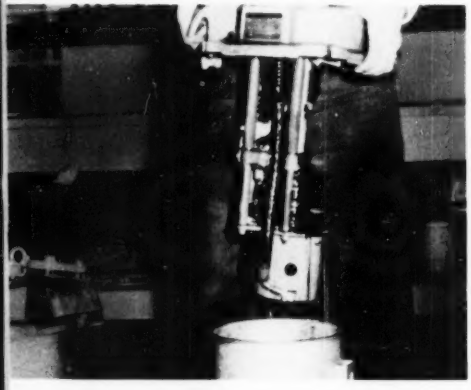
Complete testing of Reclosers and Sectionalizers is important just as it is in the case of large breakers. This testing is done in the Westinghouse High Power Laboratory under the same accurately controlled conditions.

Testing under the most severe conditions—with 15,000 volts across a single recloser—with maximum symmetrical rated current—at power factor of less than 7%—is one more reason why—you can be sure, if it's Westinghouse.

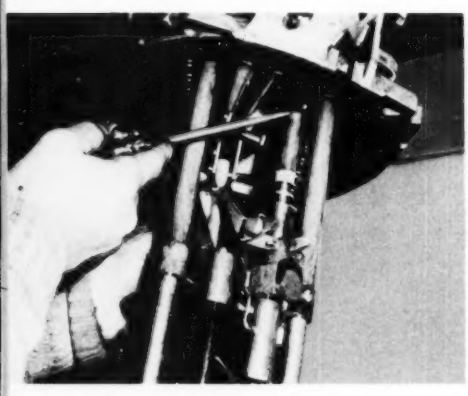


View of Westinghouse High Power Laboratory where Westinghouse Recloser and Sectionalizer designs are proved under accurately controlled conditions.

A single operation after lockout assures safety of operator. Operation is time-delay to ride through inrush currents.



Recloser is readily dismantled for inspection, change of current rating, or replacement of contacts.



A simple hydraulic timer determines tripping time, and assures positive lockout after the predetermined number of operations.

SAFE, STURDY, EASY-TO-MAINTAIN DESIGNS

Westinghouse Reclosers and Sectionalizers are the safest, most dependable devices available today. Safety is insured by a heavy drawn steel tank and cast-iron cover, both galvanized for long maintenance-free life. Safety of operating personnel is further assured through a design that allows only one operation to "lockout" when closed in on a fault. To assure picking up a line after lockout—this one operation is a "time delay" operation and will ride through and pick up inrush currents associated with a "cold line" without unnecessary openings.

Loosening four clamps which fasten the cover to the tank permits quick inspection of the contacts, tank liner, and oil. The contacts then may be replaced using only a pair of pliers. An inexpensive contact replacement kit makes this job doubly easy.

Wide Variety of Tripping Sequences Available

Tripping times are determined by a simple trouble-free hydraulic timer. A mechanical ratchet changes the operation from instantaneous to time delay and insures positive lockout after four operations under any condition of fault current or operating temperature. The simple mechanical ratchet permits selection of up to nine combinations of instantaneous and time delay openings.

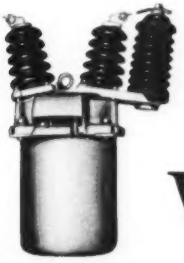
Temperature Compensation

Since the timer element is hydraulic, it is affected by oil temperature. Westinghouse Reclosers are available with temperature compensation for all locations where extremely low temperatures create fuse-recloser co-ordination problems.

Co-ordinated Lightning Protection

For completely self-protected reclosers—bushing-mounted expulsion arresters are available for mounting on any Westinghouse Recloser and Sectionalizer, as shown below.

For complete information, ask your nearby Westinghouse or Westinghouse distributor salesman for: DB 38-680—50-GR reclosers; B-4339—100-GR reclosers; DB 38-690—GRS Sectionalizers. Or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.



YOU CAN BE SURE...IF IT'S

Westinghouse

THE INDUSTRY'S MOST COMPLETE LINE OF CUTOUTS gives you unmatched versatility in line protection

Note how this line-up of Westinghouse Cutouts meets every requirement of versatile line protection. First—a choice of four basic housings (from front to rear): 50 ampere for 5000 and 7500-volt service, and 100 ampere for 5000 and 7500-volt service. Second—five individual doors, interchangeable in the same ampere rating housing (left to right): Standard-duty indicating, standard-duty non-indicating, heavy-duty indicating, heavy-duty non-indicating, and disconnect blade.

All doors fit perfectly into the housing because Prestite® porcelain, used exclusively by Westinghouse, provides a cutout offering exceptional dimensional fidelity. Positive dropout action gives a clear indication of a blown fuse. Hookstick operation permits safe, fast re-fusing. Cool operation assures long, trouble-free life. Westinghouse Cutouts have an enviable record of trouble-free service under severe temperature conditions.

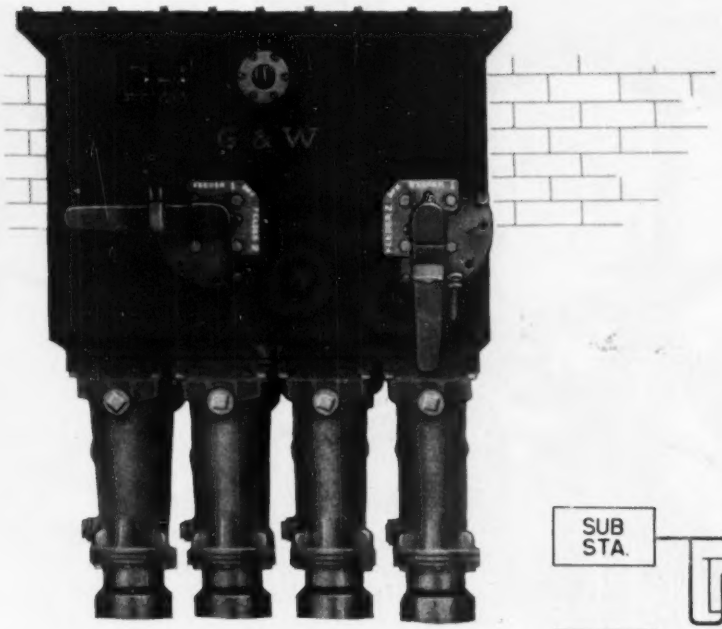
For complete information on Westinghouse Cutouts ask for copies of Booklets DB 38-625 and DB 38-628. Contact your Westinghouse representative or Westinghouse distributor or write: Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Penna.

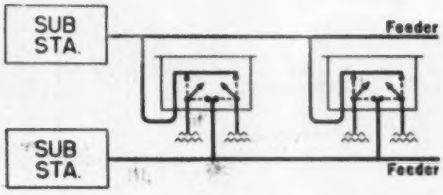
J-60791

YOU CAN BE SURE... IF IT'S
Westinghouse

DISTRIBUTION APPARATUS

AVOID SHUTDOWNS BY TRANSFERRING LOADS WITH G & W LOAD BREAK OIL SWITCHES





"RAJ" OIL SWITCHES

The Type "RAJ" is a 4-way load break* oil switch with busses and two sets of links for interconnection of two feeds and two load circuits.

Lengthy shutdowns are avoided by transferring loads to an alternate feeder when the primary power supply fails. Each load can be supplied separately or both can be connected together to either feeder.

"RAJ" switches are housed in a heavy, completely sealed, welded steel tank suitable for installation in subway, overhead, or exposed locations. Standard ratings are 7500, 15,000 and 23,000 volts with a continuous current carrying capacity of 400 amperes.

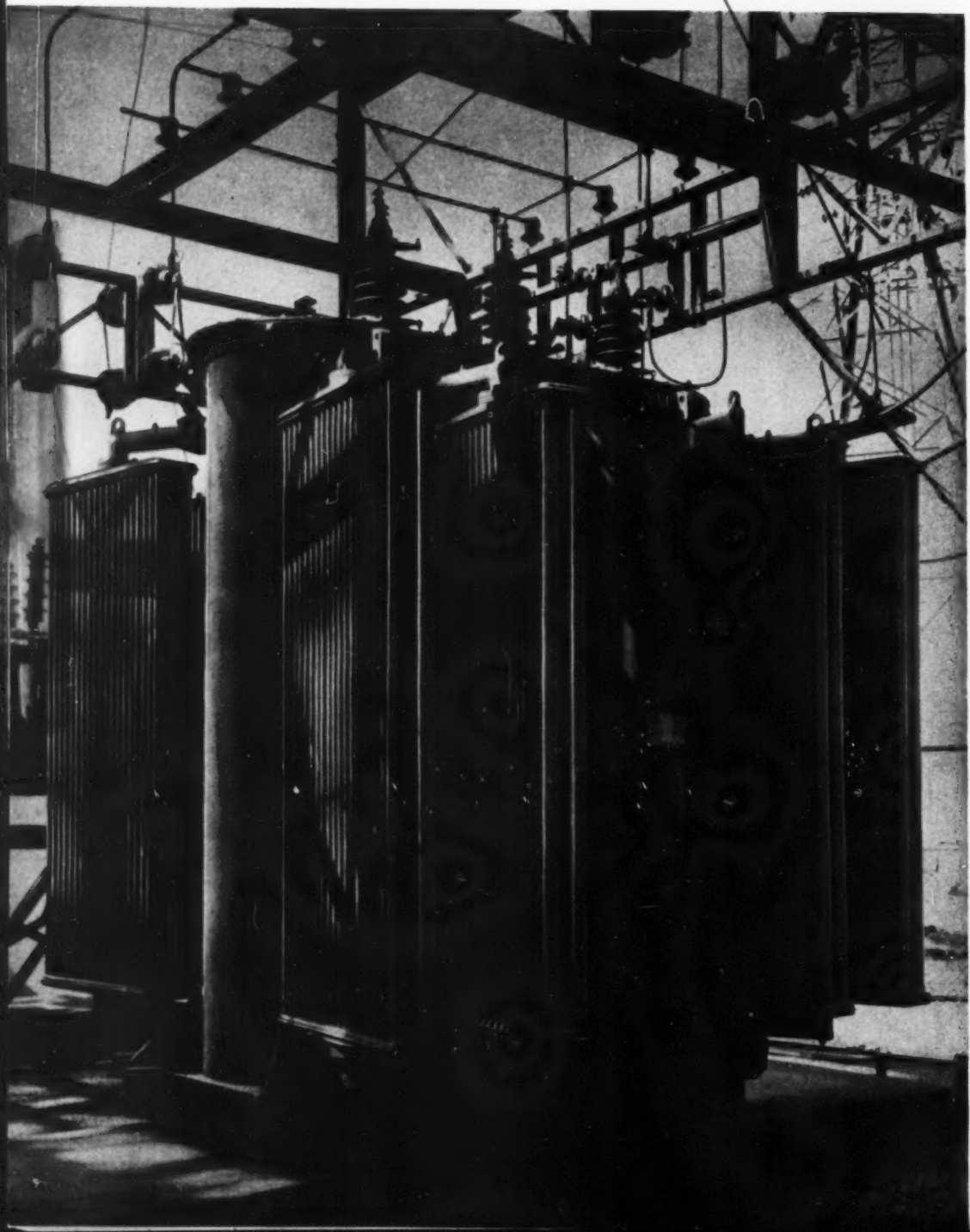
***Non-load break switches also furnished for ASKAREL filling.**

Send for Bulletin AB51, which gives complete data and prices.

G & W Bulletin H-48 shows system layouts for "Primary Cable System Flexibility". Send for your copy. There is no obligation.

G & W ELECTRIC SPECIALTY CO.
7780 Dante Avenue, Chicago 19, Ill.
Cable Terminating, Connecting and Sectionalizing Devices
Representatives in principal cities of U. S. A.
In Canada—Powerlite Devices Ltd. Toronto and Montreal

more



power for Illinois industry

Production in a large Illinois steel and wire plant gets a mighty boost from the power supplied by the substation in which this 3750 KVA three phase Kuhlman transformer is located.

The Illinois utility which selected this Kuhlman Power Transformer for this substation job is one of 15 of the country's largest power companies. Kuhlman is proud of the fact that more than two thirds of these fifteen companies are numbered among its regular customers.

Kuhlman hasn't gained the trust of such companies by accident. It has held its position only because the quality workmanship and solid construction principles which it began building into its transformers 58 years ago have continued to measure up. These are good reasons why you, too, can count on the reliability of Kuhlman Transformers. For your next transformer requirement, give the Kuhlman representative in your area a call.

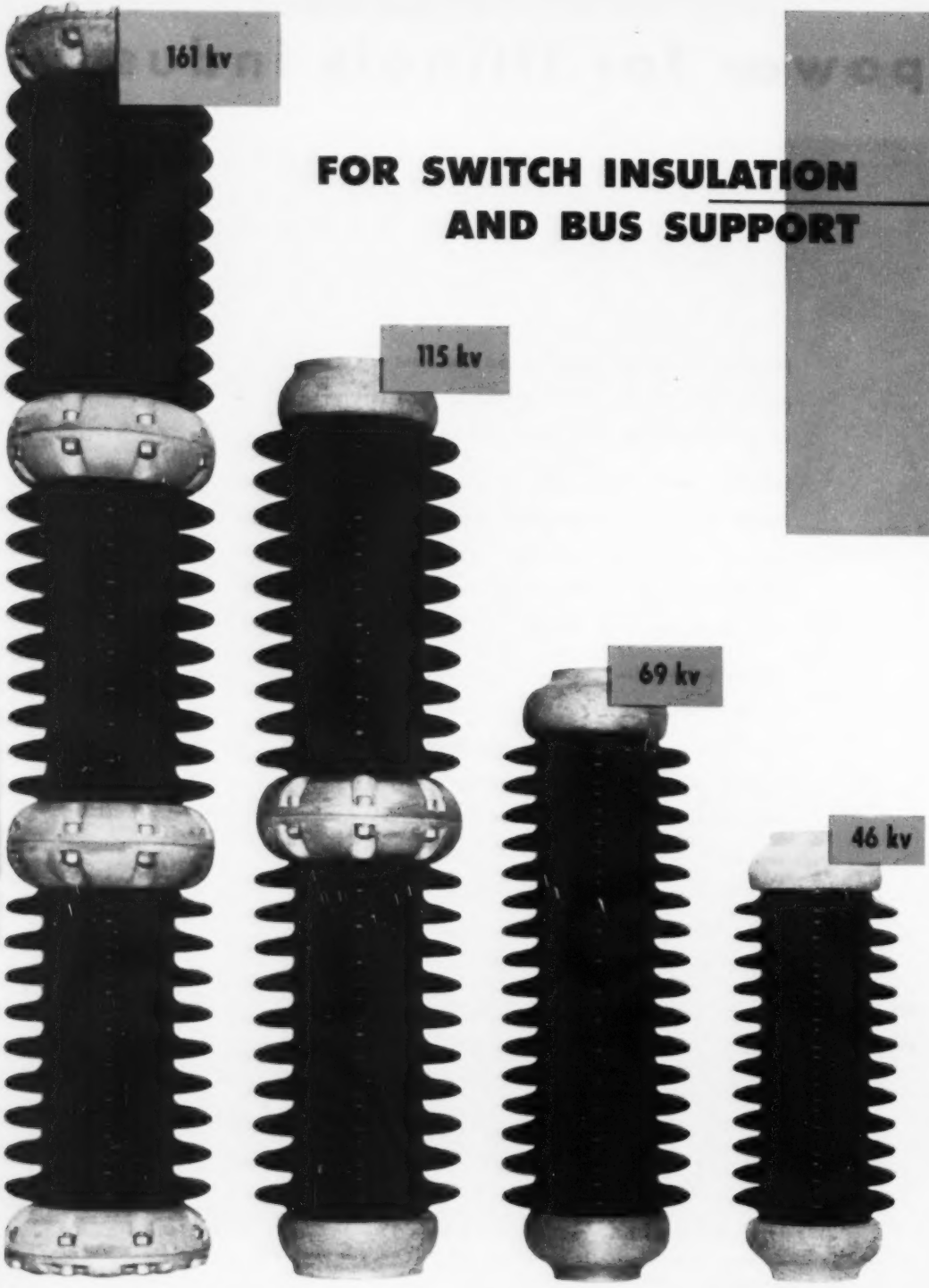
KUHLMAN ELECTRIC

Kuhlman

KUHLMAN ELECTRIC COMPANY • BAY CITY, MICHIGAN

The complete Kuhlman line covers power, distribution, dry type, Saf-T-Kuhl and specialty units. Write today for descriptive bulletins.

EXPORT REPRESENTATIVES: *International Standard Electric Corporation,* 67 Broad Street, New York 4, N.Y. Cable Address, Microphone, N.Y.



FOR SWITCH INSULATION AND BUS SUPPORT

EXTRA MECHANICAL SECURITY

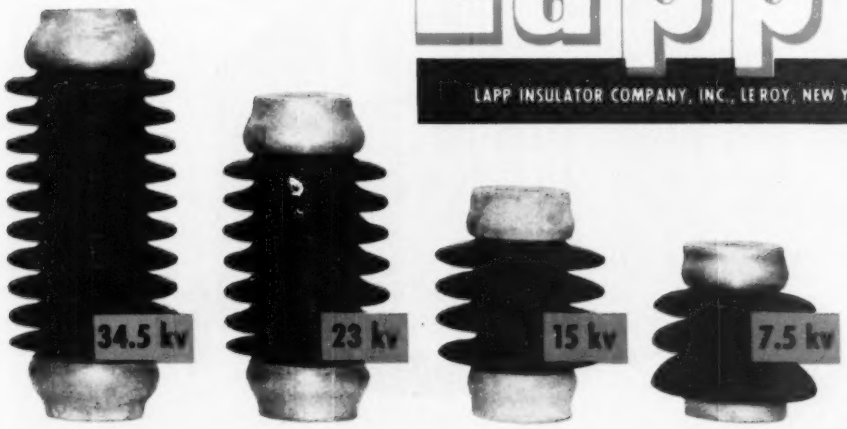
EXTRA ELECTRICAL SECURITY

EXTRA LONG LIFE

Now an exclusive standard with many companies, and widely used on practically every major system, Lapp Station Posts offer an extra margin of *proved* operating security—for switch and bus support at voltages through 161 kv. Superiority of performance comes from the Lapp Post design—a single closed-end porcelain post, with hardware externally attached, live terminals separated by the full length of the unit. This results in a puncture-proof insulator, essentially crack-proof. And because multiple petticoats are short and sturdy, performance under arcover and public attack is notably superior to that of conventional pin-cap units. Under contamination, Lapp Fog-Type corrugations provide extra-length uniform leakage path and "self-cleaning" operation in wind and rain. *In addition to the Standard Station Posts shown here, a series of High Strength Station Posts (4000 lbs. cantilever) and Extra High Strength Station Posts (8000 lbs. cantilever) is also available. See pages 60-67 of Lapp Catalog Seven.*

Lapp

LAPP INSULATOR COMPANY, INC., LE ROY, NEW YORK



OA

OW

OW/A

OA/FA

OA/FA/FA

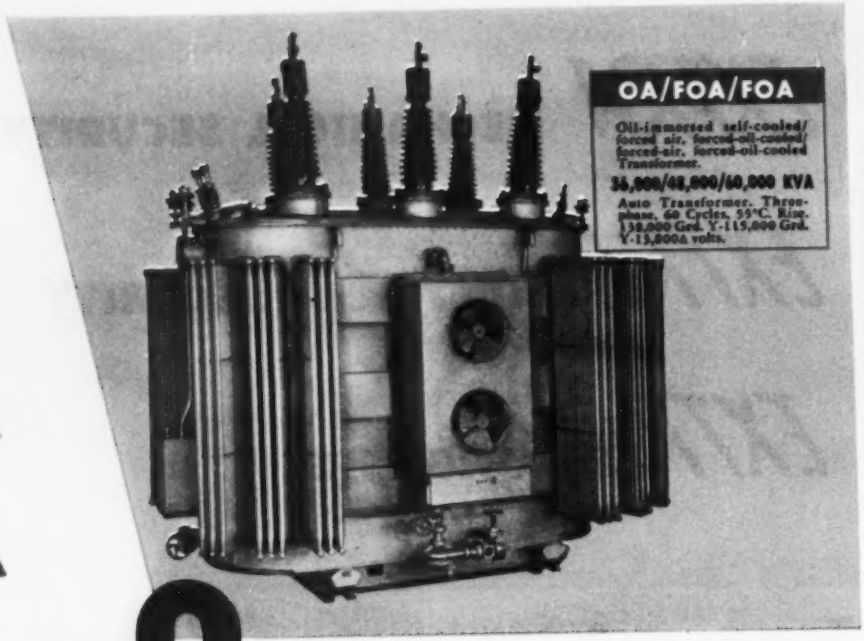
OA/FOA/FOA

OA/FA/FOA

FOW

FOA

9 ways to cool an Oil-



OA/FOA/FOA

Oil-immersed self-cooled/forced air, forced-oil-cooled/forced-air, forced-oil-cooled Transformer.

36,000/48,000/60,000 KVA

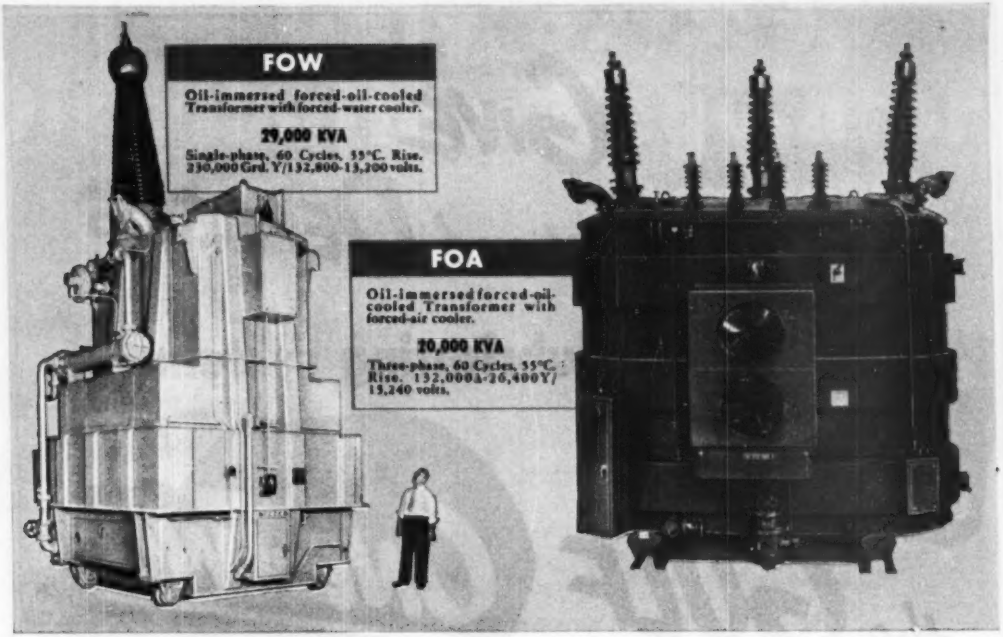
Auto Transformer. Three-phase, 60 Cycles, 55°C. Rise. 138,000 Grd. Y-115,000 Grd. Y-13,800Δ volts.

OA/FA

Oil-immersed self-cooled/forced-air-cooled Transformer.

48,000/60,000 KVA

Three-phase, 60 Cycles, 55°C. Rise. 132,000 Y-67,200 Y-13,200Δ volts.


FOW
Oil-immersed forced-oil-cooled Transformer with forced-water cooler.
29,000 KVA
Single-phase, 60 Cycles, 55°C. Rise. 230,000 Grd. Y/132,800-13,200 volts.
FOA
Oil-immersed forced-oil-cooled Transformer with forced-air cooler.
20,000 KVA
Three-phase, 60 Cycles, 55°C. Rise. 132,000Δ-76,400Y/13,240 volts.

filled power transformer

According to NEMA Standards, oil-filled transformers can be cooled in nine different ways. The manner of cooling depends upon many considerations, such as the operating characteristics of transformers using various types of cooling; the availability of large quantities of water; and what is very important, the economics of selecting one type of transformer over another.

The latter consideration may require some study. Auxiliary cooling methods applied to a self-cooled transformer can add, at relatively low cost, as much as 66⅔% additional capacity to the transformer. On the other hand, the efficiency of the transformer and the cost of operating certain types of cooling equipment may be more important considerations than the initial lower cost of a forced-cooled transformer.

These are matters that can best be discussed between the engineers who specify a transformer and the engineers who design the transformer.

Pennsylvania Transformer Company manufactures transformers of every standard classification and with every type of cooling equipment. If you have a problem in cooling, or for that matter, if you have any transformer problem, you are invited to utilize the experience of Pennsylvania's Engineering Department.

You can make arrangements for a meeting by contacting the Pennsylvania representative in your territory or by writing to Pennsylvania Transformer Company, Box 330, Canonsburg, Pa.

Write for free copy of booklet No. 522 entitled "Economics of Transformer Cooling." This booklet explains the various methods of cooling transformers and discusses their advantages and disadvantages.

Pennsylvania TRANSFORMERS

Pennsylvania TRANSFORMER COMPANY

CANONSBURG, PA. • *Greater Pittsburgh District*

GIVE OXIDATION and DEPOSITS in turbine lubricating systems

the GULF ONE-TWO

1. CLEAN IT UP WITH GULF TURBINE FLUSHING OIL

Removes grease-type slushing compounds. Carries away harmful abrasives. Protects against rust.

2. KEEP IT CLEAN WITH GULFCREST OIL

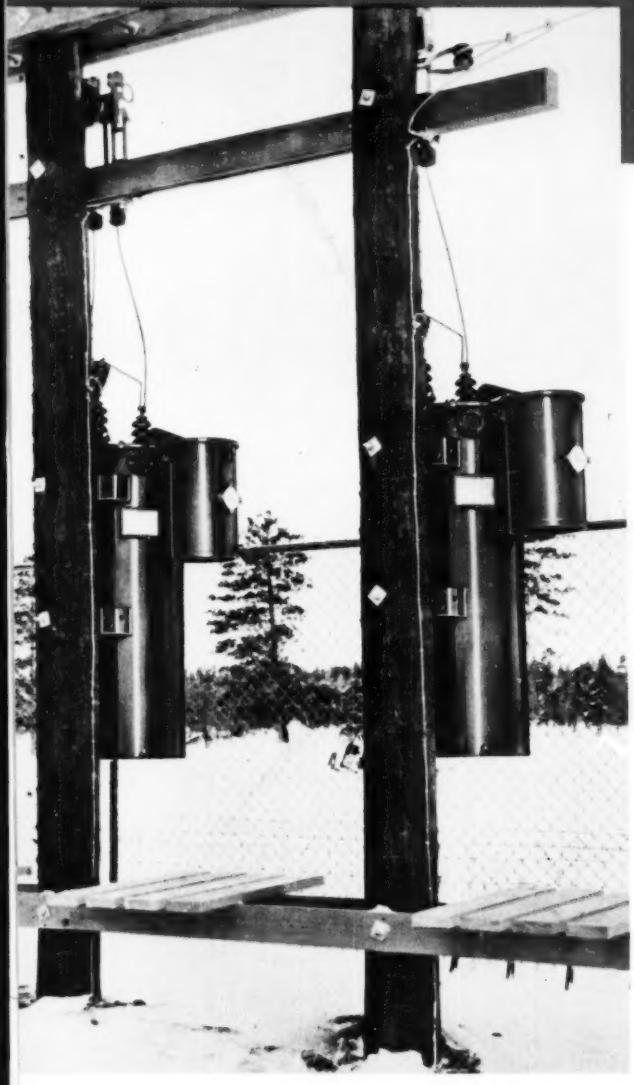
Maintains low neutralization number. Lasts indefinitely. Prevents rust on all oil-bathed surfaces.

Ask a Gulf Lubrication Engineer for additional information. Write, wire, or phone today. Gulf Oil Corporation · Gulf Refining Company, Pittsburgh 30, Pennsylvania.

GULF INDUSTRIAL LUBRICATION

The Only 32-Step Distribution Regulator

with 8 Years of Proved Accuracy and Reliability!



ALLIS-CHALMERS
5/8% STEP VOLTAGE REGULATORS

Plus

- ★ **Simple, Low-Cost Maintenance**
- ★ **Fast Installation**
- ★ **Low Initial Cost**

ALLIS-CHALMERS DISTRIBUTION REGULATORS will give you years of reliable voltage regulation. Field application to all kinds of line conditions during the past eight years has proved the value of this low-cost, reliable regulator.

It will pay you to consider Allis-Chalmers distribution regulators for every voltage application. Read the next three pages for some of the reasons.

A-3797

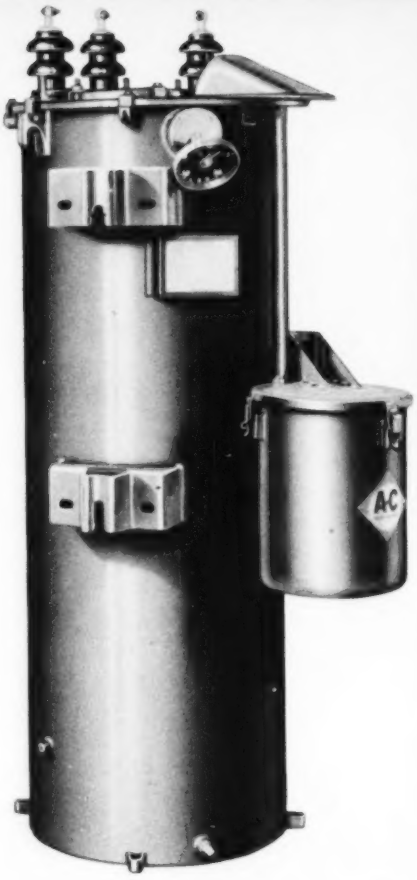
ALLIS-CHALMERS

Originators of 5/8% Step Regulation

ALLIS-CHALMERS

Distribution Regulators

Give Reliable, Accurate Regulation



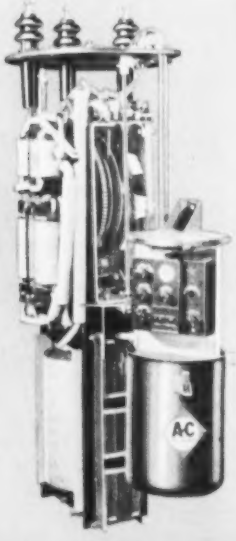
The Allis-Chalmers distribution regulator is the end result of twenty years of ⅝% step regulator design and manufacture. And the distribution regulator itself has been in field operation for eight years. No other step voltage regulator now on the market can match its combination of proved service life and high quality features of regulation. Some of these features are described on these pages.

When Allis-Chalmers distribution regulators are on your system, you get a narrow ± 1 volt band, thirty-two small ⅝% steps, 20% range of regulation, easy control adjustment, close average voltage maintained by voltage integrator and long life unit construction.

Best of all, the initial cost is low. And simplified installation and maintenance make operating costs low too.

For every voltage application, the Allis-Chalmers distribution regulator will cut costs and increase profits. Read about all the advantages you get with these low-cost units and find out how Allis-Chalmers distribution regulators will improve your system's service.

Designed and Built for Application

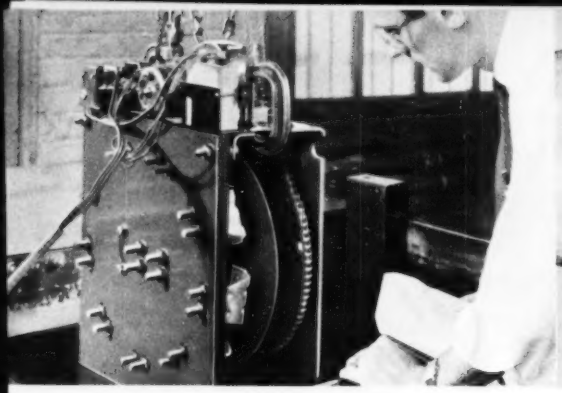


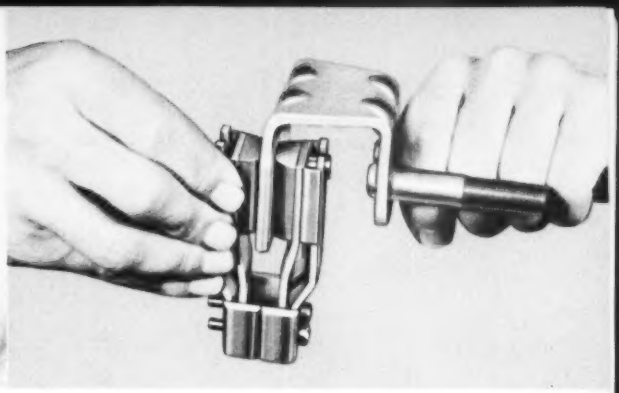
Unit-Type Construction Increases Reliability

All Allis-Chalmers regulators employ unit-type construction. The transformer, tap-changing mechanism, and control are cover-suspended. All connections are made before the unit is tanked.

High quality workmanship and thorough inspection are guaranteed because the unit is easily accessible before tanking. Any future inspection is made simple because it is possible to untank the unit without disconnecting leads or removing terminals. To remove the unit from the tank, just remove the cover bolts and handhole cover and lift it out. A separate source can be connected to the control and the regulator operated electrically.

Tap leads are brazed to the main coil and run directly to the double bolts of the stationary contacts, as the picture at left shows.





Exhaustive Life Tests Prove You Get Many Years of Accurate, Trouble-Free Voltage Regulation

5,000,000 OPERATIONS . . . equivalent to 100 years of normal service life. That's the record made by the tap-changing mechanism of an Allis-Chalmers distribution regulator in life tests.

Tap-changing mechanisms are designed for simplicity, built for rugged operation. For example, there are only three main mechanical bearings and many parts have been unitized. All nuts and bolts are securely locked for maintenance-free performance.

RATINGS AVAILABLE	7620 Volts—15, 50, 100 amp 5000 Volts—50, 100 amp 2500 Volts—100, 200 amp

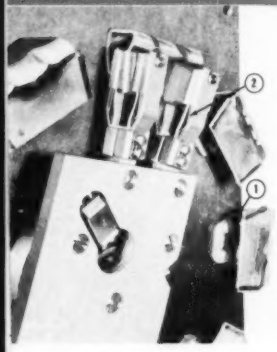
TRY TO PULL THESE CONTACTS against the spring pressure! Allis-Chalmers regulators give you contact pressure so strong you needn't worry.

These contacts give you greatest possible pressure without sacrificing tap-changing power or cushioning effect. This is one of the benefits you get from Allis-Chalmers 20 years of 5/8% step regulator experience.

Arc-resisting material and large dimensions give greater current capacity which adds to contact life. That's one reason why Allis-Chalmers distribution regulator contacts withstand 2,000,000 operations — equal to 40 years of normal service life.

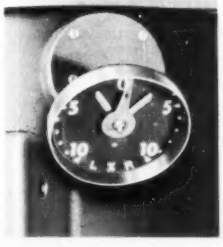
★ ★ ★

to Every Voltage Regulation Problem



STATIONARY CONTACTS are one piece and have induction welded mounting studs to eliminate a bolted connection. (1) Three piece moving contacts are equipped with a driving arm (2) to take strain off spring and allow contact pressure to remain high.

NEW SIMPLIFIED CONTROL provides calibrated voltage level for easy adjustment. Voltage level is only adjustment you make because voltage band is preset at the factory. Allis-Chalmers famous "Feather Touch" control holds contact arcing to a minimum, eliminating need for holding coils and their complicated adjustment. A new double cantilever suspension on the regulating relay increases accuracy and extends service life of the relay. The entire control panel can be removed and replaced simply and fast, for calibrating or adjustment in the shop. A single jack plug disconnects all wiring.



POSITION INDICATOR shows percent of raise and lower, is equipped with drag pointers to show operating range of regulator. Drag pointers are easily reset. Accurate reading of indicator is assured by a direct mechanical drive and slotted shaft that guarantees positive alignment with tap changer. Position indicator is supplied on units over 50 amps.

Fast, Simple Maintenance

Whether your Allis-Chalmers distribution regulators are mounted on poles or closer to the ground, you'll find that maintenance is fast and low-cost. Allis-Chalmers twenty years of designing 5/8% step regulators pays off in a simple design that doesn't sacrifice accuracy or reliability.

CONTROL IS QUICKLY REPLACED

The control is a good example. To check it, just flip the cover hasps and drop the control housing to mechanical stops. If service is needed, your lineman can replace the entire control with a spare in a few minutes. The only connection is a jack plug.

Your linemen don't have to be technical specialists because the control can easily be returned to the shop for a thorough check-up. Best of all, your regulator isn't out of service during the check-up.

UNTANKING IS EASY

To untank the regulator, just remove the cover bolts and handhole cover and lift the transformer and tap-changing mechanism out of the tank. No connections to break, no terminals to remove, no oil to handle.

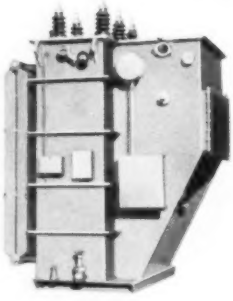
Get These Features On All

ALLIS-CHALMERS
5/8% STEP VOLTAGE REGULATORS

1. 5/8% Steps
2. Close Regulation (± 1 volt band)
3. Easy control adjustment. The same type of control used on all sizes.
4. Close average voltage (maintained by voltage integrator).
5. Long life contacts of liberal design to withstand hundreds of thousands of operations.
6. Tap-changing drive mechanism with balanced spring action to eliminate shock . . . operates under oil for long trouble-free life.
7. Unit construction to simplify your maintenance requirements.

Call your nearest A-C district office for more information, or write:

Allis-Chalmers Manufacturing Company
General Machinery Division
Milwaukee 1, Wisconsin



Station Type Three Phase Regulator

Station Type Single Phase Regulator

Distribution Regulator

ALLIS-CHALMERS

Originators of 5/8% Step Regulation

WHY DOES TRIANGLE GET SO MANY BIG JOBS?

When it's a big, important project, chances are that Triangle wire, cable and conduit are being specified. Electrical contractors for some of America's top industrial concerns, many of them vitally concerned in the defense effort, have used Triangle products.

Here are a few of the projects where contractors used Triangle: Kaiser · Chrysler · New Jersey Turnpike Authority · Greater Pittsburgh Airport · Bell & Howell · Ford Motor Co. · General Motors · Anheuser Busch · Standard Oil · Sun Oil · Wheeling Steel · Weirton Steel · Otis Elevator · Du Pont · National Biscuit · TVA · Atomic Energy Commission · Detroit Edison.

Dependability

IS THE ANSWER

Triangle gets big jobs because people know ***YOU CAN DEPEND ON TRIANGLE—FOR QUALITY AND SERVICE.***

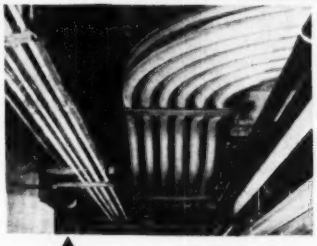
A TYPICAL EXAMPLE

The World's Second Largest Airport

Electrical Engineer—James Paul Warner—Pittsburgh
Architect—Joseph Hoover—Pittsburgh
Electrical Contractor—Howard P. Foley Co.—Pittsburgh

TRIANGLE Hot-Dip Galvanized Conduit

This conduit, placed in underground tunnels, carries feeder cables from powerhouse. Triangle conduit is hot-dip galvanized inside and out. It bends easily, resists flaking.



Just completed, the greater Pittsburgh Airport is a typical example of the major jobs Triangle has serviced. Over a million feet of Triangle conduit and cable were used. The airport, costing $32 million, is exceeded in size only by Idlewild Airport, Long Island, New York.

Whether you need a few feet of cable — or order your material in car load lots —

You Can Depend On **TRIANGLE**

The Trade Mark of Top Quality

TRIANGLE
IT MUST BE RIGHT! ®

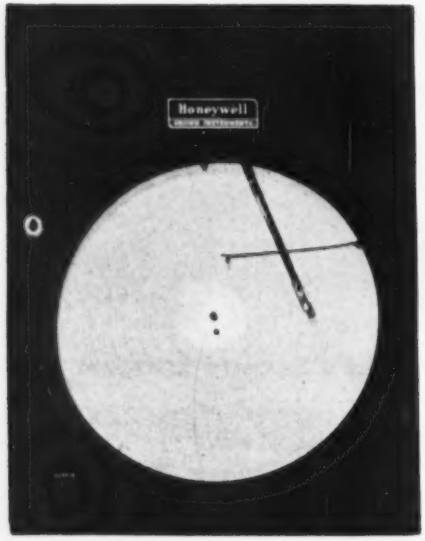
TRIANGLE CONDUIT & CABLE CO., INC.

New Brunswick, New Jersey

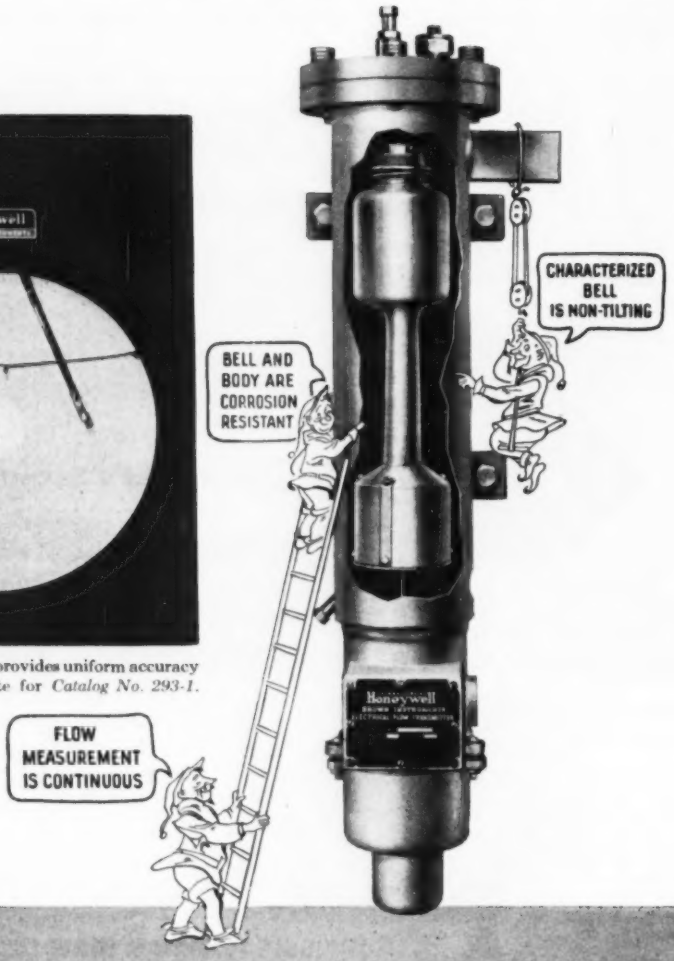
"Glazon" Building Wire • "Glazon" Non-Metallic Sheathed Cable • Control Wire • Armored Cable • Service Entrance, Service Drop • Varnished Cambric, Braided or Leaded • Trioprene Trench, Power & Parkway Cables • Bare Wire • Rigid Conduit Hot-Dipped Galvanized & Black Enameled • Electric Metallic Thin Wall Conduit • Flexible Steel Conduit.

Important Contribution to

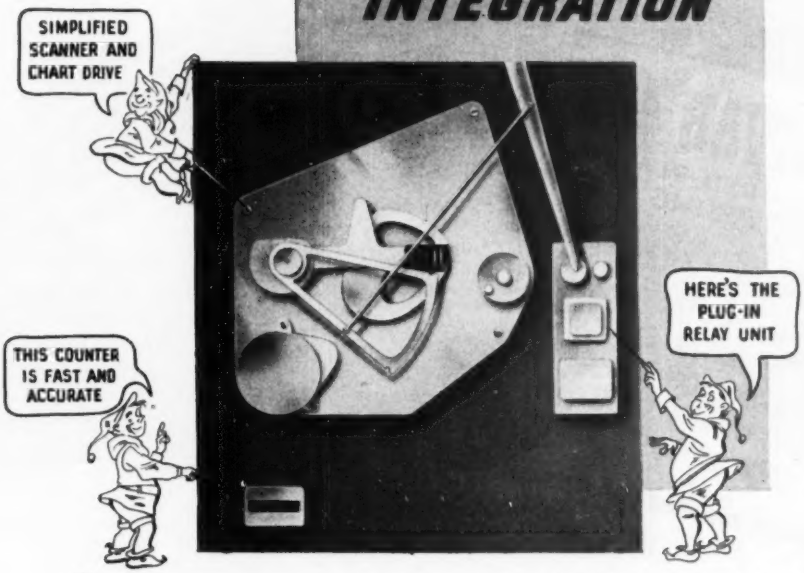
The Brown Electric Flow Meter



EVENLY DIVIDED CHART . . . provides uniform accuracy for all rates of flow. Write for *Catalog No. 293-1.*



incorporates . . . ELECTRONIC INTEGRATION



Two important features...evenly divided chart and electronic integration... facilitate flow cost accounting; eliminate intermittent measurement and slow, complicated totalizing.

The electronic integrator, consisting of but three major parts, simplifies accessibility and maintenance . . . permits quick checking and calibration. Scanning is rapid and extremely simple. The corrosion resistant meter body is of tubular construction, reducing weight and bulk. Transmission is electric. Mechanical flow meters, evenly graduated and similar to that shown, but with the bell directly coupled to the recorder pen are also available. Recorder is fast, chart is easily read under all conditions of flow. The characterized bell is corrosion resistant, too, and is specially designed to eliminate tilting.

Call in our local engineering representative for a discussion of your application.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, 4568 Wayne Ave., Philadelphia 44, Pa.

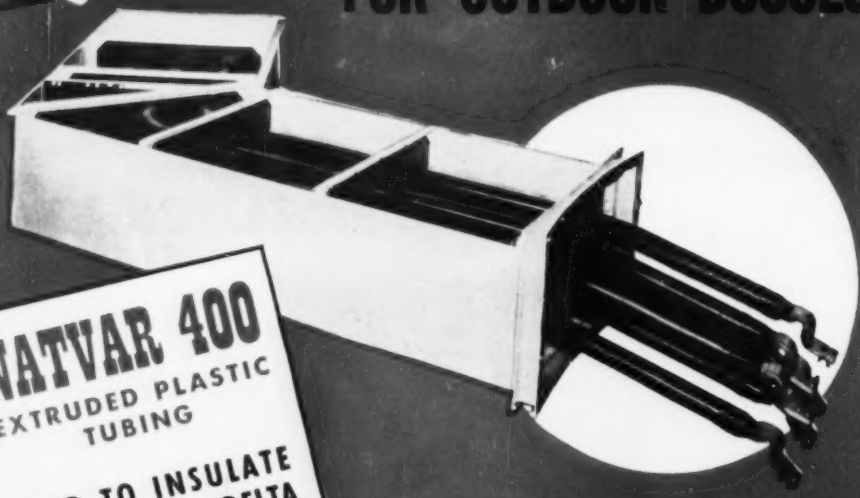
MINNEAPOLIS
Honeywell
BROWN INSTRUMENTS

First in Controls

● *Important Reference Data*

Write for a copy of Catalog No. 293-1, "Evenly Graduated Flow Meters" . . . and Bulletin No. 80-2, "Supervisory Instruments for Power Generation."

Snug Fitting ALL-WEATHER JACKET FOR OUTDOOR BUSSES



NATVAR 400
EXTRUDED PLASTIC TUBING

USED TO INSULATE AND PROTECT DELTA STAR METAL-ENCLOSED BUSSES FOR THE DEPT. OF WATER & POWER, CITY OF LOS ANGELES

These 15 KV, 2000 Ampere busses were built for outdoor service where space was limited. Therefore to meet this requirement, each conductor of 5" I.P.S. (5⅛" O.D.) hard-drawn copper tubing was covered with a smooth, tight sleeve of Natvar 400 tubing, 5" I.D. Natvar tubing having a ⅛" wall thickness was immersed in a dilating solution before it was slipped over the conductor. The result is a snug fitting, uniform insulating jacket, that increases the insulation to adequately protect the bus from phase to phase short circuits in the event of heavy voltage surges, and at the same time safeguards life against accidental contact with the bus conductor potential.

Delta Star Electric Company, Chicago, manufacturers of high voltage switching equipment, build many types of metal-enclosed busses of their own design, and also manufacture several types to meet customer's own specifications.

Their close attention to details in designing, in selection of materials, in assembling, and in testing before shipment has paid off in reducing costs of installation, and in dependable performance after installation.

In the metal enclosed busses built by Delta Star for the Department of Water & Power, City of Los Angeles, Natvar 400 extruded plastic tubing was used to insulate and protect the bus tubes because it is easy to dilate and apply, and because when it shrinks, it provides a snug jacket with uniformly good electrical and physical properties.

Natvar 400 tubing, tape, and other Natvar flexible electrical insulating materials are consistently uniform, no matter when or where purchased. They are available either from your wholesaler's stocks or direct from our own.

Natvar

Natvar Products

- Varnished cambric—straight cut and bias
- Varnished cable tape
- Varnished canvas
- Varnished duck
- Varnished silk
- Varnished special rayon
- Varnished Fiberglas cloth
- Silicone coated Fiberglas
- Varnished papers
- Slot insulation
- Varnished tubing and sleeving
- Varnished identification markers
- Lacquered tubing and sleeving
- Extruded plastic tubing and tape
- Extruded plastic identification markers

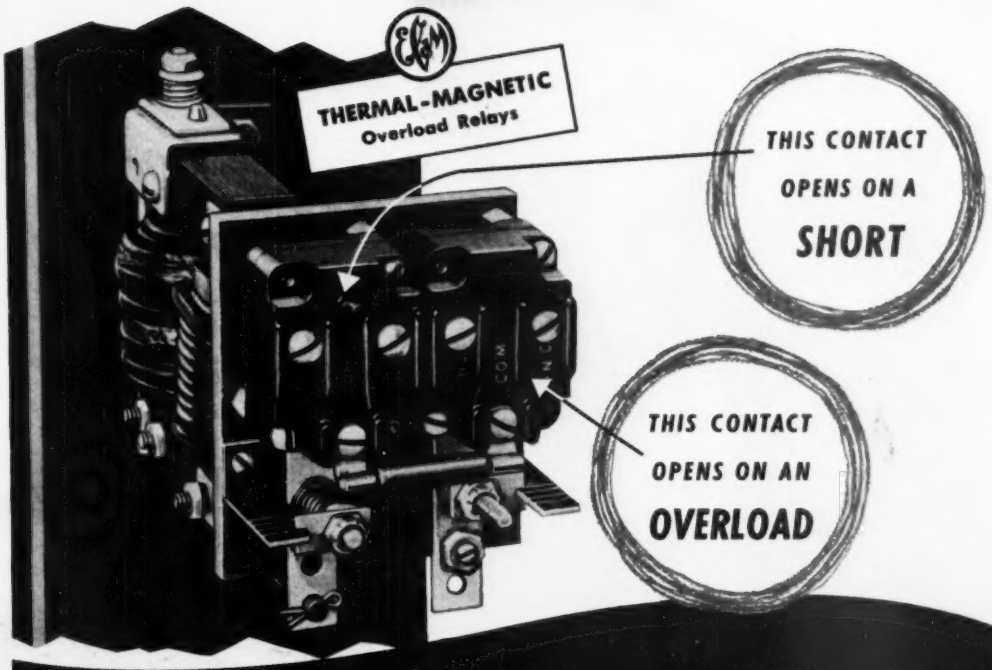
Ask for Catalog No. 22

NATVAR CORPORATION

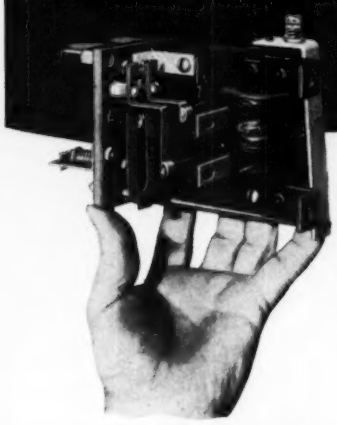
FORMERLY THE NATIONAL VARNISHED PRODUCTS CORPORATION

TELEPHONE RAHWAY 7-8800 — CABLE ADDRESS NATVAR: RAHWAY, N. J.

221 RANDOLPH AVENUE • WOODBRIDGE, NEW JERSEY



Independent *trips* save electrician's time in locating trouble



¾ rear view shows independent thermal and magnetic tripping elements—both are adjustable. Relay is front-connected, removable as a unit from the mounting-base.

When a motor stops, the electrician soon finds whether an *over-current* or a *fault* has caused the shutdown. EC&M THERMAL-MAGNETIC Overload Relays have independent thermal and instantaneous tripping elements operated from *one magnetic source*. Contacts are also independent with the instantaneous-element regularly furnished with hand-reset contacts. A quick look distinguishes between wiring trouble and motor overloading—*cuts downtime up to half*.

EC&M Type ZTM Overload Relays combine the *proven advantages* of *Thermal* and *Magnetic* tripping characteristics for complete a-c motor protection . . . increased life of motor insulation—elimination of useless tripping on harmless temporary overloads—minimized damage on faults. For certain enclosed motors with no inbuilt overload capacity, these relays are set to operate from 90% to 110% full load motor current to safeguard non-stop operation.

WRITE TODAY FOR NEW BULLETIN 1180-331

THE ELECTRIC CONTROLLER & MFG. CO.
2698 EAST 79TH STREET • CLEVELAND 4, OHIO

Facts from
MONTANA

"'CSP' Transformers cut failures 50 to 1"

"We have been using 'CSP' Transformers for the past ten years," says a Montana Utility. "One of our divisions now has about 1,000 'CSP' Transformers in service, and an equal number of the conventional type.

"Of all our 'CSP' transformers, we have lost but one from lightning. During this 10-year period, we have been losing an average of five conventional transformers per year. That means a ratio of approximately 50 to 1 in favor of the 'CSP'."

Old standards for judging transformers were discarded when the "CSP" (Completely Self-Protecting) Transformer was introduced. The "CSP" transformer, with both lightning and thermal protection built in, has slashed costs, cut maintenance, and improved service continuity. Its reputation has been won by performance in the field, in instances like this one—records that have made it first choice with utilities coast to coast.

Installation and maintenance costs for Westinghouse "CSP" Transformers are always lower, because complete protective equipment is built in, not separately mounted. A two-year survey of Electric Light and Power Companies shows the following:

NATIONAL AVERAGES

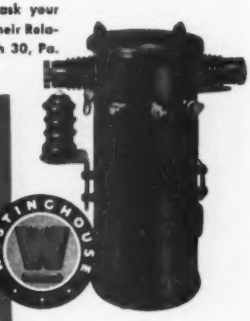
	"CSP"	Conventional
Installation Costs	$13.87	$24.74
Burn-out Rate	0.257%	1.005%
Fuse Outages	None	5.64% @ $6.52 per outage
Load Checks	Automatic	12.8%
Breaker Reset	1.02%	None

If you'd like to check your own costs against these national averages, ask your Westinghouse representative for Booklet B-4247-B, "Transformer Costs and Their Relation to Profits". Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

"CSP" devices . . . originated and patented by Westinghouse

YOU CAN BE SURE... IF IT'S
Westinghouse

"CSP" DISTRIBUTION TRANSFORMERS



J-70591

Takes the trouble out of "trouble shooting"

A light-duty International has a hidden extra that keeps it on the job. It's STAMINA.

An International light-duty truck is *all truck* . . . with the same kind of engineering that has kept Internationals first in heavy-duty truck sales for 20 straight years. Result: It stays on the job at lower operating and maintenance costs. It's easy to handle, and gives you the driving comfort of the roomiest cab on the road.

Want to save money? See your International Dealer or Branch, soon.

INTERNATIONAL HARVESTER COMPANY • CHICAGO

Look for these exclusive International advantages:

- Silver Diamond valve-in-head truck engines, built in the world's largest truck engine plant.
- The "roomiest, most comfortable cab on the road"—the Comfo-Vision Cab. One piece, full vision windshield. New green tinted "Solex Duplate" glass available.
- Super-steering system—more positive control, easier handling. 37° turning angle for greater maneuverability.
- Wide variety of light-duty models—GVW ratings from 4,200 to 8,600 lbs. 115, 127, 134-in. wheelbases. Pickup, panel, stake and other types of bodies to meet all needs.
- More than half the International Trucks ever built are still on the job.

International Harvester Builds McCormick Farm Equipment and Farmall Tractors . . . Motor Trucks . . . Industrial Power . . . Refrigerators and Freezers

Better roads mean a better America

INTERNATIONAL TRUCKS

"Standard of the Highway"

International L-120 series with special utility bodies—7.9 and 8.6-ft. lengths. 115 and 127-in. wheelbases.

Now you get DOUBLE holding power

L-M Guy Clamps with TORKOL-Treated Nuts

Work Faster, Easier!

Now you can use *one* guy clamp where you formerly used two! Tests show that with Torkol nut lubricant—an L-M "exclusive"—wrench torque develops twice the normal holding power of an untreated clamp. High strength, heat-treated bolts assure plenty of extra strength.

THESE TESTS TELL THE TORKOL STORY

Recent tests compared the holding power of Torkol-treated 3-bolt clamps with untreated 3-bolt clamps. The pull required to produce ⅛-inch slip of the guy strand was measured for a wide range of wrench-torque values. Results were plotted into comparative "Nut-Torque vs. Holding Power" curves shown at the right.

SEE WHAT A DIFFERENCE!

To hold a pull of 7000 pounds, using ⅜" high strength guy strand and clamps with ⅝" dia. bolts, required the following nut torques:

with *un*treated clamps, 120 foot-pounds torque;

with Torkol-treated clamps, 52 foot-pounds—less than half as much!

The extra holding power of L-M Torkol-treated guy clamps often permits the use of a clamp with smaller bolts. For example: With 3-bolt clamps with ⅝" bolts, on ⅜" HS strand, with 90 foot-pounds of torque:

*un*treated clamp held a 5800-pound pull;

Torkol-treated clamp held 12,400 lbs.

With a 3-bolt clamp with ½" bolts:

*un*treated clamp held a 3800-pound pull;

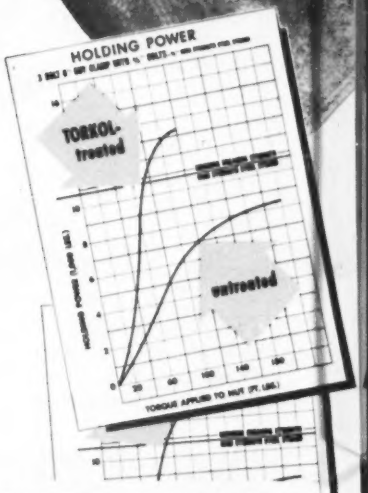
Torkol-treated clamp held 9700 pounds.

The Torkol-treated clamp with ½" bolts held 3900 pounds more than the untreated clamp with ⅝" bolts! The possible savings are obvious.

SERVES YOU BETTER—COSTS NO MORE

With L-M Guy Clamps, you save on material, cut installation time, and get far better strength-balance in the whole guying installation. What's more, Torkol-treated L-M clamps contribute to worker-safety, for they seldom require heavy muscular effort with its risks of straining and danger. *And L-M Torkol-treated clamps cost you no more!*

Torkol is a Line Material Trademark

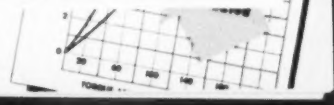


GET THESE NEW FACTS ON "TORKOL"

Want a complete set of these new Torkol test curves? Eight charts cover the guy-strand range from ¼" to ⅝"—and permit coordination of guy clamp holding strength with that of other components. Ask your L-M Field Engineer, or write Line Material Company, Milwaukee 1, Wis. (a McGraw Electric Company Division).

L-M Guy Clamps are made in styles from one to four bolts, of heavily galvanized steel. Smooth grooves with rounded edges prevent strand damage. The high-strength bolts may be inserted from either side.

All nuts are Torkol-treated—identified by their yellowish color. They go on quickly, stay tight, unscrew easily, may be reused. Clean. Dry. Unaffected by weather or weather changes.

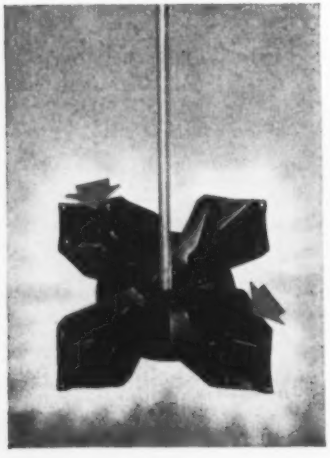


LINE MATERIAL

Line Construction Materials

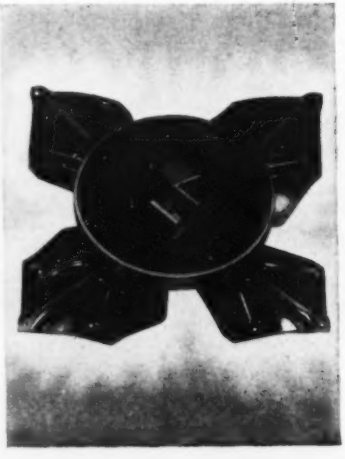
Complete Coordinated Equipment for Distribution Today

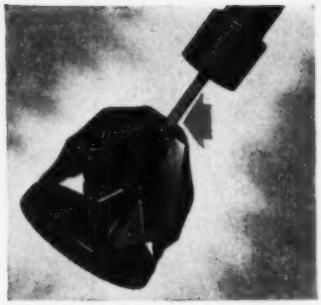
Two-piece design . . . The four blades are formed of a single piece of steel, and are held to the base plate by four small bolts, which simply shear off by tamping. The center hole is extruded downwards. This extrusion provides a bearing surface against the rod to prevent binding; it reinforces the tamping area; and it provides an audible signal when the extrusion strikes the base, indicating full expansion.



Top view . . . Notice the additional area inside the center of gravity of two opposed blades which gives utmost area for increased holding power, without sacrificing balance of the anchor.

Base plate . . . Heavy steel, with skirted edge to prevent deformation. A nut retainer strap welded to the underside reinforces the hole so that the nut cannot pull through the base plate.





Anchor closed . . . Notice the large square tamping area, and the wide hinge sections which keep the blades from twisting if a stone is encountered while the anchor is being expanded.

Partly open . . . Arched, shovel-shaped blades slide into the earth with a minimum of soil disturbance. Heavy ribs on the underside decrease friction between blades and base plate.

Fully expanded . . . A large percentage of the expanded area is in undisturbed earth. Therefore load can be applied to the anchor immediately after installation, with little danger of creepage.

L-M's New 4-Way Pressed Steel Anchors Designed for Exceptional Strength

L-M has recently completed an extensive series of tests that reveal exceptional strength and holding power in the new 4-Way anchors.

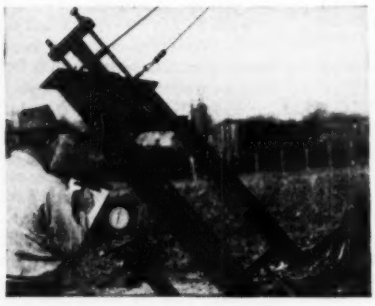
These anchors are easy to install. They have ample holding power above their nominal ratings. There is a generous safety factor in mechanical strength of all parts. And the cost is low!

The design offers many desirable features. A large square tamping area is well reinforced by the downward extrusion of the anchor rod hole, which also provides a bearing area against the rod. Arched, pointed blades slide into the earth without disturbing it, permitting application of the load right after installation. Heavy ribs reinforce the blades and reduce friction against the base plate during expansion. Nut retainer strap reinforces the base, and keeps the nut from pulling through. All three sizes are REA-accepted.

For details and samples ask the L-M Field Engineer; or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

Available in Three Sizes

Catalog No.	20002681	20002682	20002683
Expanded Area, square inches	110	125	132
Nominal Holding Power Class, pounds	6000	8000	10,000
Diameter, closed, inches	8	8	8
Anchor Rod Diameter, inches	⅝, ¾	⅝, ¾	1
Minimum Strength of anchor without deformation, pounds	16,000	21,000	24,000



Hydraulic lift mounted on U-shaped steel frame with pump and pressure gauge for recording the pounds of pull applied to anchor rod. Tests at vertical and 45° angle showed ample mechanical strength of all parts, well balanced against holding power.

81

LINE MATERIAL

Line Construction Materials

Complete Coordinated Equipment for Distribution Today

LET'S LOOK AT THE FACTS

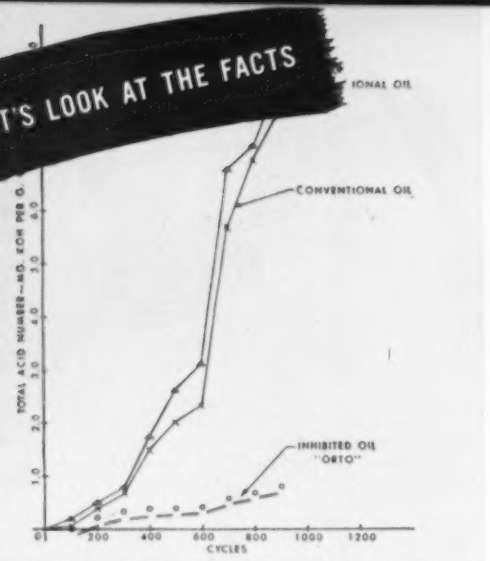


FIGURE 1—Comparison of acids formed by inhibited (ORTO) oil and conventional transformer oils in laboratory tests. Reduction of acid formation increases the life of the oil two to three times, and prolongs the life of the cellulose insulation.

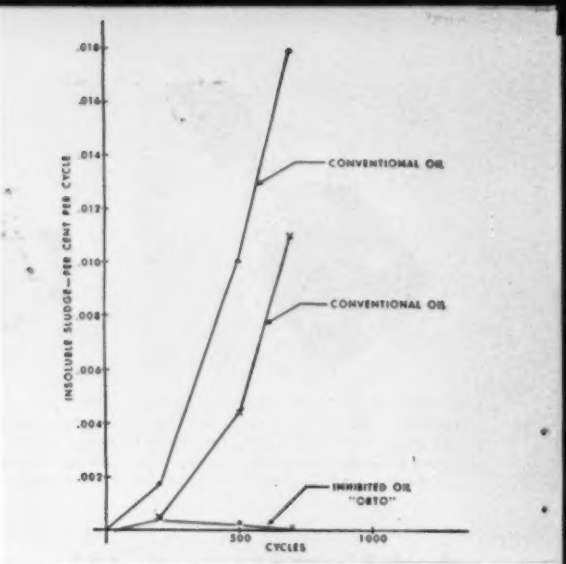


FIGURE 2—Comparison of sludge formation in conventional and inhibited (ORTO) oils in laboratory tests. The prevention of sludge formation appreciably lengthens life of the oil and the transformer, and maintains high overload capacity.

L-M's ORTO® Lengthens Transformer Life and Increases Overload Capacity

by **MARTIN I. ZWELLING,**
Chief Laboratory Engineer,
Transformer Division, Line Material Co.

The life of a transformer is largely determined by the life of the cellulose insulation. This, in turn, is dependent upon temperature of operation, formation of acids, and the length of time these two reactants are in effect.

Obviously the prevention of acid by an inhibitor eliminates one reactant (Figure 1). The prevention of sludge (Figure 2) modifies the other—temperature—by permitting free oil circulation, and thus keeps cellulose deterioration at a low rate. Surge strength and short-circuit strength are maintained at high levels throughout the transformer's life span.

Maintains Overload Capacity

Generally speaking, inhibited oil will improve overload capacity by maintaining the original capacity of the transformer over a greater proportion of its life. Actually, in high magnitude, short duration overloads, the temperature of the oil does not increase to any great degree, and heat affects only the cellulose insulation. But if the prevention of acid formation has protected the cellulose insulation from deterioration, the transformer is better able to handle a high short-time overload without damage.

In the case of long time, low magnitude overloads, the use of an inhibited oil such as ORTO has an even more marked effect. In conventional oils, overload capacity will be decreased as oxidation builds up increasing amounts of acid and blanketing layers of sludge (Figure 3). By preventing the formation of acids and sludge, the transformer maintains its initial high overload capacity for a greater proportion of its life (Figure 4).

Lengthens Transformer Life

If an operator obtains a certain life expectancy from a transformer under certain operating conditions, life will be increased with an inhibited oil under these same operating conditions. Or, with the same operating conditions and the *same life expectancy*, a certain increase in the overload is possible with ORTO.

Long term tests (Figure 5) and short

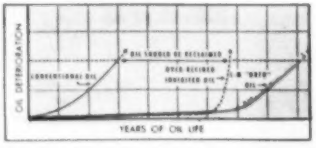


FIGURE 8—Comparative curves show the deterioration in service of a conventional oil, an inhibited over-refined oil, and ORTO brand oil, in which deterioration, when it finally starts, follows the same gradual curve as any high grade conventional oil.

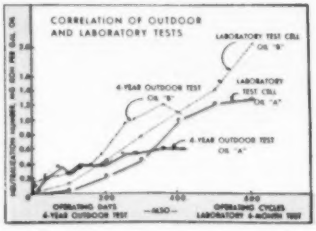

CORRELATION OF OUTDOOR AND LABORATORY TESTS
LABORATORY TEST CELL OIL "B"
4-YEAR OUTDOOR TEST OIL "B"
LABORATORY TEST CELL OIL "A"
4-YEAR OUTDOOR TEST OIL "A"
OPERATING DAYS 4-YEAR OUTDOOR TEST
OPERATING CYCLES LABORATORY 6-MONTH TEST

FIGURE 7—Typical curves showing the close correlation between the 4-year outdoor tests and the laboratory tests on two oils. This close correlation prevailed throughout on the various oils tested and in the wide variety of tests made.

term accelerated tests (Figure 6) have been made which show a marked degree of correlation (Figure 7). These tests indicate that the inhibitor in ORTO greatly prolongs oil life before acid and sludge deterioration commences, and that after this deterioration starts, ORTO follows the same gradual curve of any high grade conventional oil (Figure 8). The inhibitor has no harmful effects, it does not react with any other known inhibitor, and it may be blended with other oils, new or reclaimed, inhibited or non-inhibited. Naturally when ORTO is blended with another oil a certain amount of dilution occurs which reduces the effective life-extension properties of the inhibitor to the extent that ORTO is diluted. The overall effect of ORTO can be safely judged from the diagram.

FIGURE 3—Laboratory test coil after the equivalent of about 18 years service using a good grade of conventional oil. Notice the heavy sludge deposits, which have clogged oil passages, causing higher temperatures, deterioration of insulation, and lower overload capacity.

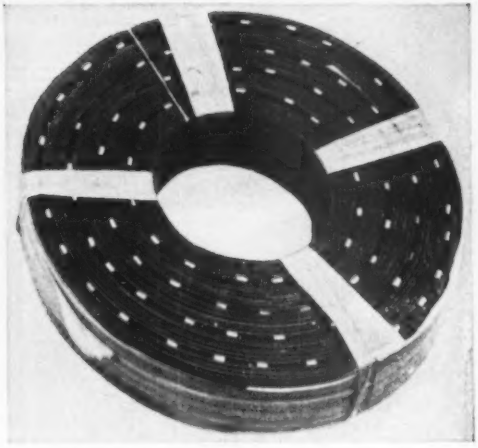


FIGURE 4—Here is an identical coil, after operating for the same period of time under the same conditions except that the oil was ORTO. Acid and sludge formation has been prevented; oil passages are clear; initial overload capacity and impulse strength have been maintained.

FIGURE 5—Outdoor tests started some years ago were used as a basis for developing accelerated laboratory tests. These outdoor tests were closely checked against other long time tests run by oil companies and utility companies, and were correlated with laboratory procedure.

FIGURE 6—Laboratory equipment in which conventional and inhibited oils were tested under closely controlled conditions. The laboratory test permitted precise recording of acid and sludge formation and of deterioration of insulation, wire, and other parts of the transformer.

Look at the facts! Get details on L-M Round-Wound Transformers

L-M Round-Wound transformers consist of a wound core, with round coils wound directly onto the core, which therefore is not cut or unwound, and air gaps are not introduced.

Because of the design and the long, round coils, the transformers offer better regulation, high short time overload capacity, high impulse level and high short circuit strength, low exciting current, and better loss ratios. And they are filled with ORTO, L-M's outstanding Oxidation Resistant Transformer Oil!

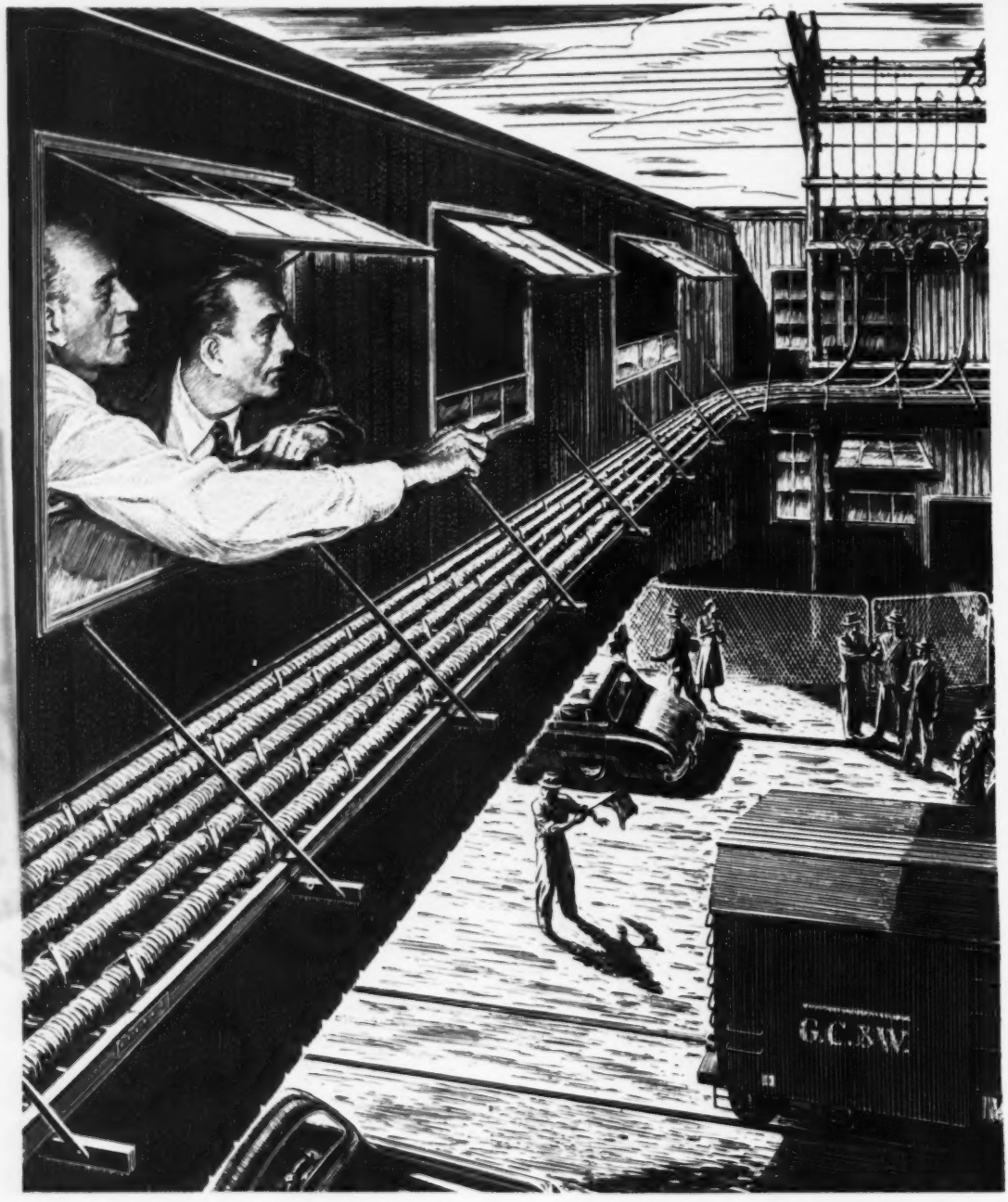
Get the facts from the L-M Field Engineer, or write Mr. Zwelling at the Transformer Division, Line Material Company, Zanesville, Ohio (a McGraw Electric Company Division).

LINE MATERIAL
Transformers

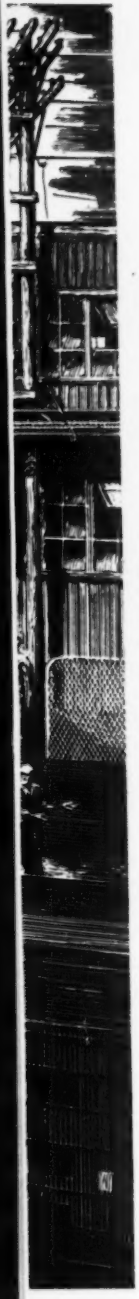
ORTO

85

Complete Coordinated Equipment for Distribution Today



These G-E interlocked armor cables, used by Southern Indiana Gas and Electric to feed a large industrial customer, can carry a total of more than 1,650 amperes at 5,000 volts. Such cable is now available for voltages up to 15 kv, and in conductor sizes up to 750 MCM for either indoor or outdoor use. An interesting point, not generally known: ampere rating of interlocked armor cable is higher than for the same size rubber- or varnished-cambric-insulated cable in conduit.



WIRE AND CABLE FOR ELECTRIC UTILITIES

The G-E interlocked armor cable system becomes a

"Railroad Track for power"

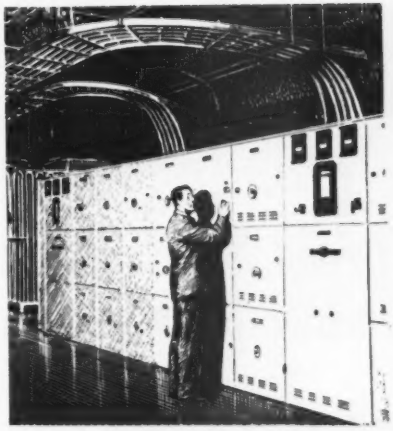
New uses for established G-E products are often developed in cooperation with electric utility companies. General Electric engineers, working with a utility, explore new applications and many times discover completely new areas where time and money can be saved. The varnished-cambric interlocked armor cable system is a case in point.

For example: The Southern Indiana Gas and Electric Company was faced with the problem of running feeders from two existing overhead circuits across a heavily traveled thoroughfare to supply a large industrial customer.

The solution worked out with the electric utility was this: At the pole structure, where two overhead circuits terminated, transfer power to five lengths of three-conductor, 5-kv interlocked armor cable. The cables cross the street on inexpensive racks attached to the outside of an aerial passageway.

General Electric offered a ladder rack and interlocked armor cable arrangement which the electric utility company chose to use for this application. Material costs were lower, time was saved, and the appearance is excellent. The installation looks like a small, neat railroad track —a "railroad track for power" that has a capacity of 12,000 kva.

When you are wondering about an unusual use for an accepted type of cable, call in your G-E Construction Materials field man. He can put the entire G-E staff to work on your problem and may save you time and money. Write Section W35-727, Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.

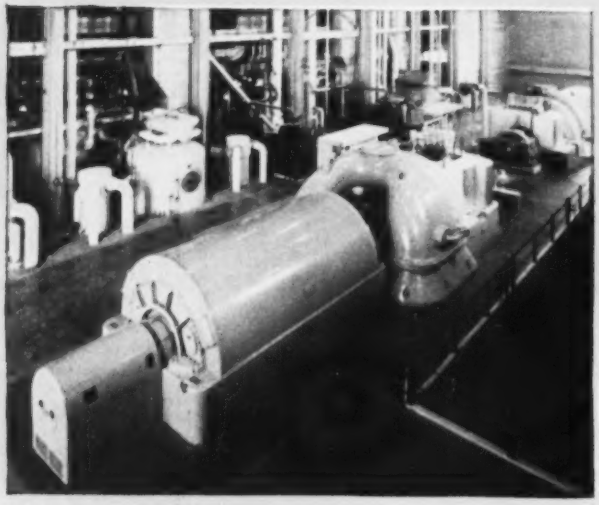


This load center in an industrial plant both receives and distributes its power with General Electric's flexible interlocked armor cable laid on racks hung from the ceiling. An important advantage here: the plant got into operation in record time because interlocked armor cable could be installed faster than underground or other types of overhead cable installations.

You can put your confidence in—

GENERAL ELECTRIC

"Through performance alone... inhibited turbine oils have won preference among major utility operators"



...and here's why so many of them choose **SHELL TURBO OIL**

Shell Turbo Oil exceeds every accepted specification for premium turbine lubricants. These are the notable qualities:

1. HIGHEST ATTAINABLE RUST PROTECTION

An effective *combination* of rust inhibiting additives goes to work at the source of rust formation. Rust problems are reduced to the very lowest level.

2. COMPLETE OXIDATION STABILITY

The anti-oxidant in Shell Turbo Oil has so far defied improvement! It provides outstanding oxidation stability and thereby minimizes sludge formation.

3. ANTI-FOAMING

The anti-foam agent used is so effective that air entrainment can be tolerated for considerable periods—avoiding unscheduled shutdowns.

4. EXCELLENT EMULSION CHARACTERISTICS

Shell Turbo Oil's remarkable protection against rust and oxidation is attained with the minimum tendency to formation of water emulsions in service.

5. PROTECTION AGAINST WEAR

The inhibitive agents in Shell Turbo Oil *add* to the wear-reducing qualities of the specially refined oil itself, an extra margin of safety for the bearings during critical starting periods.

We'll be glad to give you the full story on Shell Turbo Oil, with specific recommendations for your own generating units.

SHELL OIL COMPANY

50 West 50th Street,
New York 20, New York,
or 100 Bush Street,
San Francisco 6, California.

SHELL

SHELL TURBO OIL

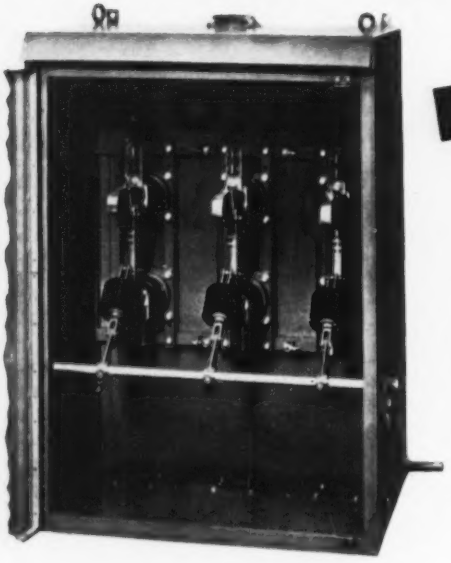
1500 KVA
INDOOR SUBSTATION TRANSFORMER

COMPACT
DEPENDABLE
for
INDUSTRIAL
SERVICE

This 1500 KVA Uptegraff indoor Unit Substation Transformer is one of three identical units supplied complete—including switchgear—by Uptegraff for a large mid-western industrial firm. The sturdy design of core and coil assembly is clearly evident in the photograph at the left. The strong, rigid tank is designed to withstand eight pounds pressure or vacuum. Transformer is designed for sealed-tank operation, and a super-sensitive electronic leak-detector is used to insure that even the smallest leaks in tanks and bushings are completely eliminated. Transformer is rated at 1500 KVA, 2400-480 volts, 3 phase.

R. E. UPTEGRAFF MANUFACTURING CO. SCOTTDALE, PENNSYLVANIA

High Voltage Current Interruption Without External Arcing



3 P.S.T. 400 ampere 15KV metal enclosed Air Interrupter Switch. Enclosure door open, insulating barriers not shown.

CHECK THESE 3E FEATURES

SAFETY . . . All metal enclosure designed in accordance with the best engineering and manufacturing practices. For additional safety, positive interlocks, with doors and related equipment are available.

ACCESSIBILITY . . . These compact 3E Switches provide easier inspection, maintenance and adjustment in a normal amount of space.

ECONOMY . . . There are many conditions under which 3E Air Interrupter Switches when combined with power fuses can spell real economy. Switches are used for load interruption and fuses for short circuit protection . . . doing away with more expensive circuit interrupting equipment.

3E Air Interrupter Switches will safely interrupt loads up to 600 amperes at 15,000. They provide a visible gap for isolation of apparatus, and use self-generated gas blasts to extinguish the fully confined arc. No oil or other inflammable liquids are used.

Consult your nearest 3E representative or write us for information as to how the 3E Interrupter Switch can be applied to your switchgear requirements.

ELECTRICAL ENGINEERS EQUIPMENT CO.

3E AIR INTERRUPTER SWITCHES

MELROSE PARK, ILLINOIS

When James R. Kearney Corporation planned its unique substation, near St. Louis, Missouri, penta preservative was specified for the wood employed. The Kearney substation, which takes its power from Union Electric Company of Missouri lines, is the only one of its kind in the world. Actually, it is a piece of laboratory equipment used to test fuse-protective devices rated up to 69,000 volts and 100 amperes.

Monsanto Penta protects unique substation

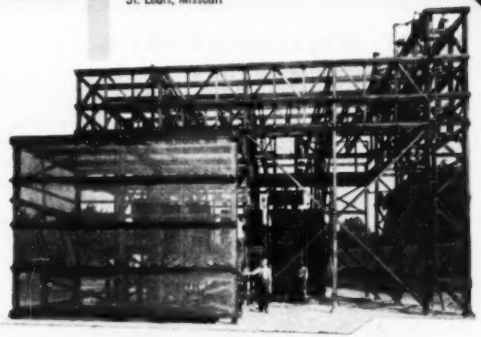
Monsanto Penta was applied in solution by pressure so that wood retained 6 pounds per cubic foot. Fourteen thousand four hundred and ninety-nine board feet of laminated lumber were treated. The Kearney Corporation selected penta preservative because Kearney executives consider penta a standard of the electrical industry.

Monsanto Penta is a stable chemical developed specifically for wood preservation. It does not leach. Rain and ground water cannot wash it away. Penta protects against termites and other wood-boring insects. It prevents decay. It can be formulated into clean treatments that leave wood paintable.

Contact the nearest Monsanto Sales Office or write for further information on the use of penta to preserve wood in substations, transformer platforms, poles, crossarms or construction. MONSANTO CHEMICAL COMPANY, Organic Chemicals Division, 1700 South Second Street, St. Louis 4, Missouri.

DISTRICT SALES OFFICES: Birmingham, Boston, Charlotte, Chicago, Cincinnati, Cleveland, Detroit, Houston, Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Seattle, Twin Cities. In Canada, Monsanto Canada Limited, Montreal.

Engineering	James R. Kearney Corporation, St. Louis, Missouri
Builder	Fruin-Colnon Contracting Company, St. Louis, Missouri
Laminated Wood	Rilco Laminated Products Company, Albert Lea, Minn.
Wood Treaters	Associated Wood Preservers, Inc., St. Louis, Missouri



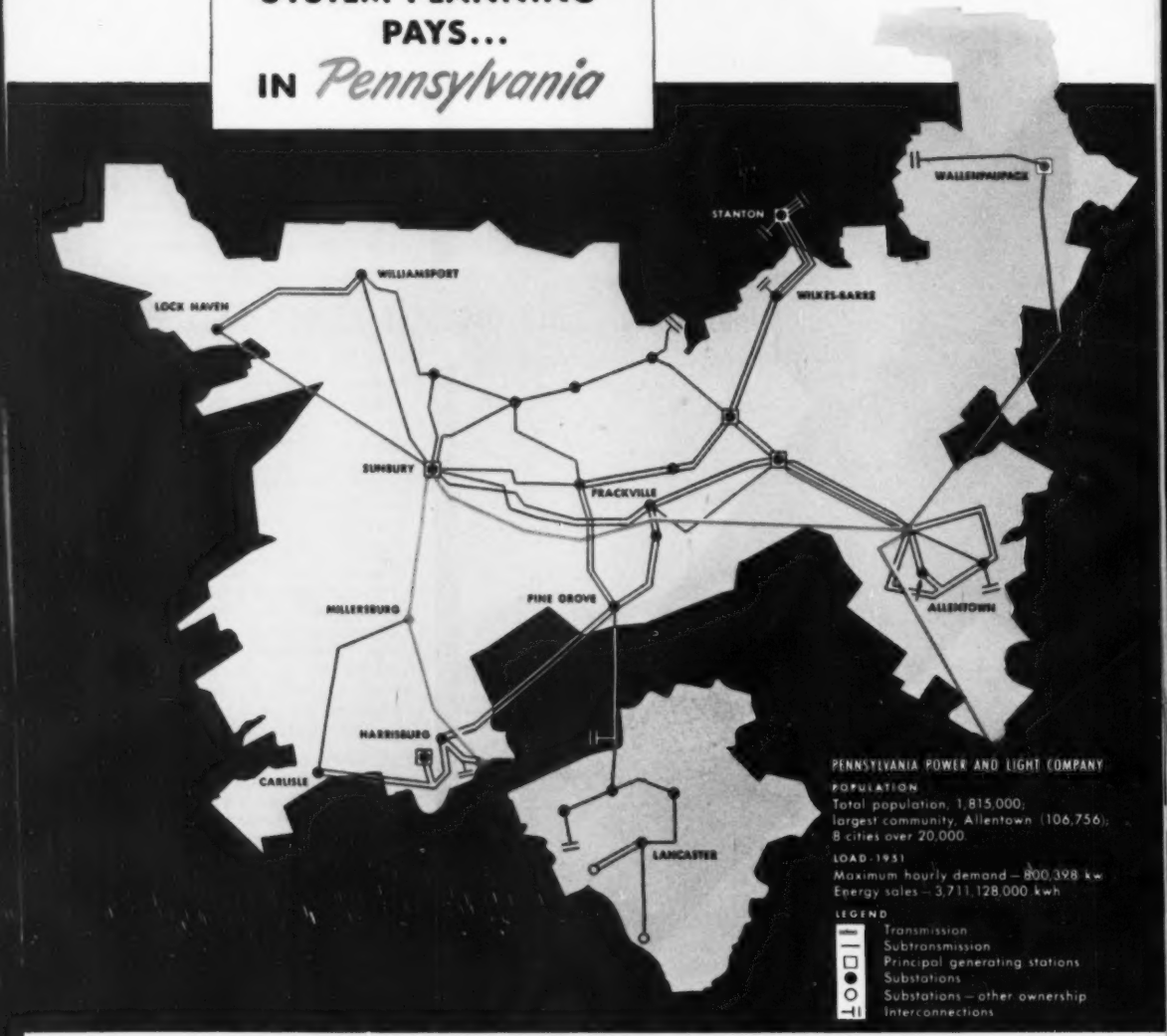
James R. Kearney Corporation substation, near St. Louis, was visited by many electrical engineers during a recent convention. Wood in the structure is protected by Monsanto Penta.

PENTA

MONSANTO CHEMICALS—PLASTICS

SERVING INDUSTRY . . . WHICH SERVES MANKIND

SYSTEM PLANNING PAYS... IN *Pennsylvania*

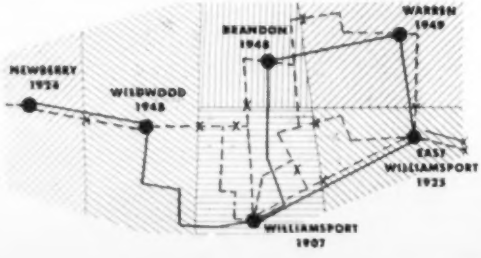


HOW THEY MET LOAD GROWTH AT WILLIAMSPORT...

In 1907, Williamsport had a load of 400 kw, with only one substation required. By 1925, the load had increased to 5000 kw, resulting in additions of substations in both the eastern and western parts of the area.

LEGEND
- 12-kv lines
- 4-kv lines
- Area of load responsibility
- Substation and year established
- Normal sectionalizing

Since 1925, the load has increased to 14,000 kw in 1951, and three more substations added. The lines feeding into Williamsport provide the reliability and capacity to expand the distribution system as the load grows.



Small power blocks ...long-range solution

Pennsylvania Power and Light Company can judge accurately the results of their system planning. Today this careful, long-range planning is reflected in their ability to supply more load . . . to grow easily and economically . . . to provide new high levels of service continuity. Small units of "load responsibility" are the cornerstone of this system, permitting them to take full advantage of modern *unitized* substations. The success of their long-range simplified system planning is measured by the practical yardstick of "economic workability".

How they built their system . . . Definite "load responsibility" such as 1500-2000 kva for 4 kv, and 3000-10,000 kva for 12 kv, is assigned to each block. As the load grows, additional blocks of load responsibility are supplied from a carefully planned 66-kv subtransmission system, covering their 9500 square miles of area served. This simplified network, in conjunction with an overlying high-voltage transmission system, permits picking up blocks of load or introducing power supply where required, and enables Pennsylvania Power and Light Company to utilize the inherent flexibility and reliability of modern unitized substations.

Meeting the growth is the payoff . . . While easily and economically meeting load-growth problems like that at Williamsport, the Pennsylvania Power and Light Company have carried on a tremendous expansion program, adding capacity throughout the system. With changes in electrical demands, it won't be necessary to change their "plan" . . . they'll simply accelerate it or slow it down, as the situation requires. Because of the economy and effectiveness of such planning, this progressive utility has every reason to face new peak loads confidently . . . they're ready to grow and grow!

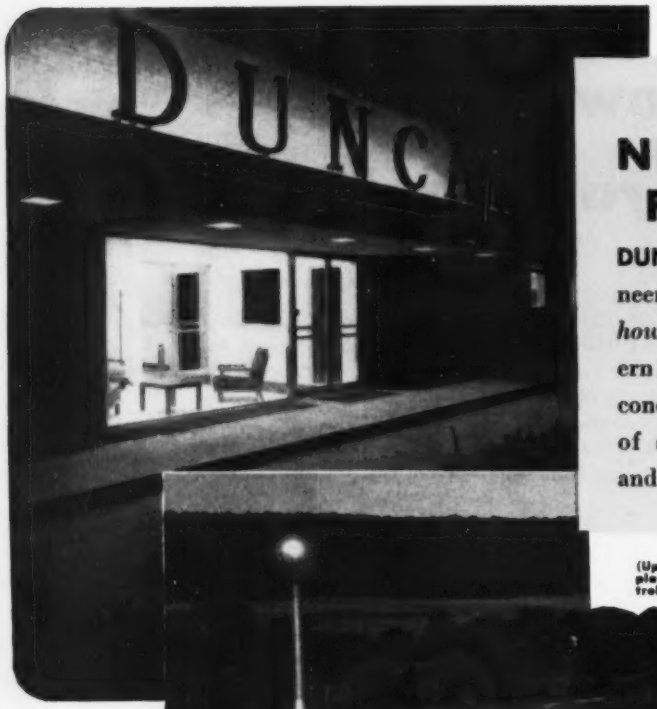
Westinghouse modern unitized equipment, when installed as an integral part of such a long-range plan, can contribute to the ease, dependability, and economy of your operation. A completely staffed System Planning Service is ready to assist you. Call your nearby Westinghouse Office or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Penna.

J-97160

YOU CAN BE SURE...IF IT'S

Westinghouse

SYSTEM PLANNING SERVICE



To serve you

NEW PLANT FACILITIES

DUNCAN'S fifty years of engineering and production *know how*—now operating in modern facilities, under controlled conditions—is your guarantee of sound watthour meters and metering equipment.

(Upper left) Main entrance to the new Duncan plant . . . completely air-conditioned . . . controlled humidity. Construction by The Austin Co.

DUNCAN

1901 FIFTY YEARS OF SERVICE 1951

Watthour Meters • Demand Meters • Sockets
Heavy Duty Mounting Devices
Instrument Transformers

(Above) New Duncan plant . . . Aerial view looking toward Wabash Valley.

Engineering and drafting facilities . . . constantly working to meet industry requirements.

Manufacturing Area . . . high level of illumination precision equipment . . . cleanliness, a must.

DUNCAN ELECTRIC MFG. CO. **LAFAYETTE, INDIANA**

As with every other product, there can be weakling cables and robust cables. Weakling cables are those that can be classified as having anemia of the insulation. In other words, they do not have the insulation stamina to stand up under the electrical and physical conditions to which they will be subjected. It's this kind of cable that will haunt you.

Simplex-ANHYDREX XX Cables come from a robust family. They have a guaranteed water absorption of only 15 milligrams of water when tested in accordance with U.S.C.G. specifications. They will not crack when exposed to severe ozone conditions. Simplex Anhydrex XX insulation is so robust that it will withstand these tests before or AFTER the insulation has been aged for 7 days at 250°F. (121°C.). Simplex-ANHYDREX XX Cables are recommended for operation at copper temperatures up to 176°F. (80°C.) in either wet or dry locations.

Here is an insulation that doesn't ask for special favors. It's the kind of insulation you should have on your important feeder, network, and station cables that operate in the voltage range of 2,000 to 17,000 volts. These cables won't haunt you.

Want to know more about this robust insulation? Simply send your request to the address below.

SIMPLEX-ANHYDREX XX

SIMPLEX WIRE & CABLE CO.
79 Sidney St., Cambridge 39, Mass.

Radio-relay station at Evanston, Wyoming

a Watcher for lonesome places

Alarm-receiving bay in town. Lights on a chart report on 42 separate conditions affecting service. Telephone is to communicate with maintenance crews. Eleven alarm centers across the country cover all 107 radio-relay stations. Stations too far off the beaten trail for wire connections signal by very high frequency radio.

Many of the Bell System's 107 radio stations connecting New York and San Francisco by microwave radio-relay stand on hills and mountains far from towns. Day after day, the apparatus does its duty; no man need be there to watch it. But when trouble threatens, an alarm system developed by Bell Telephone Laboratories alerts a testman in a town perhaps a hundred miles away.

A bell rings. The testman sends a signal which asks what is wrong. A pattern of lights gives the answer —a power interruption, an overheated tube, a blown fuse, a drop in pressure of the dry air which keeps moisture out of the waveguide. At intervals the testman puts the system through its paces to be sure it is on guard.

Sometimes the testman can correct a trouble condition through remote control, or the station may cure itself—for example, by switching in an emergency power supply. Sometimes the trouble can await the next visit of a maintenance man—sometimes he is dispatched at once.

This is one of the newest examples of the way Bell Laboratories adds value to your telephone system by reducing maintenance costs and increasing reliability.

BELL TELEPHONE LABORATORIES

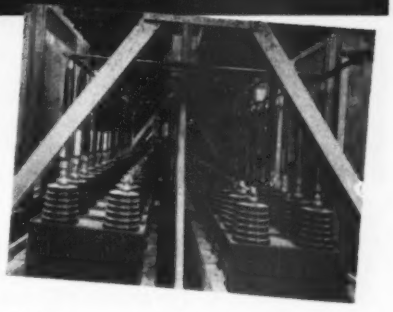
IMPROVING TELEPHONE SERVICE FOR AMERICA PROVIDES CAREERS FOR CREATIVE MEN IN SCIENTIFIC AND TECHNICAL FIELDS.

99.5%

BONNEVILLE reports:

TROUBLE-FREE SERVICE FROM IT'S C-D CAPACITORS

Bonneville Power Administration reports that its C-D capacitors have so far delivered over 1,100,000,000 Kvar hours of 99.5% trouble-free service — an unmatched field performance record!



a typical time-tested C-D installation

C-D 18,790 Kvar sub-station, part of 20,160 Kvar purchased for Longview in 1942.

A C-D engineer will be glad to point out the many dollar-saving characteristics of C-D capacitors.

CORNELL-DUBILIER ELECTRIC CORP.
DEPARTMENT D72-B
SOUTH PLAINFIELD, N. J.

1910
1952

CONSISTENTLY DEPENDABLE

CORNELL-DUBILIER CAPACITORS

PLANTS IN: SOUTH PLAINFIELD, N. J.; NEW BEDFORD, WORCESTER, CAMBRIDGE, MASS.; PROVIDENCE, R. I.; INDIANAPOLIS, IND.; FUQUAY SPRINGS, N. C. AND SUBSIDIARY: THE RADIART CORP., CLEVELAND, OHIO

60-cell FME-15 Exide-Manchex in battery room. Mounted on #37343 two-step Exide rack.

(Left) Aerial view of test and control buildings and high-voltage yard of new G-E Switchgear Development Laboratory at Philadelphia.

IN THE NEW G-E SWITCHGEAR DEVELOPMENT LABORATORY

Exide-Manchex BATTERIES

"Largest of its type in the world!" These are among the words used to describe the new high-capacity development laboratory of the General Electric Company. It is capable of delivering 5,250,000 kva asymmetrical, 3,200,000 kva symmetrical, 3 phase, at generator voltage, and of testing power circuit breakers and other switchgear apparatus at voltages up to 440,000 volts.

The battery being used for tripping and closing the breakers in this development work is the Exide Manchex. The battery will also be used for oscillograph operations and to supply indicating lamp loads and power for two 15-hp lube oil emergency pumps for the generators.

With Exide-Manchex Batteries on the job, you can always count on positive switchgear operation . . . instantaneous power . . . extra long battery life . . . low costs of operation, maintenance, depreciation. Exide is your best battery buy . . . *at any* price.

• • •

Various sizes and types of Exide Batteries, up to 100 ampere-hours capacity, are available in plastic containers.

THE ELECTRIC STORAGE BATTERY CO.
Philadelphia 2

Exide Batteries of Canada, Limited, Toronto

"Exide" and "Manchex" Reg. T.M. U.S. Pat. Off.

1888 . . . DEPENDABLE BATTERIES FOR 64 YEARS . . . 1952

New G-E Radio System in tough mountain terrain

CUTS SERVICE COSTS 50%

Radio links utility offices and power plants over 10,000 square mile area despite elevations up to 7,000 feet.

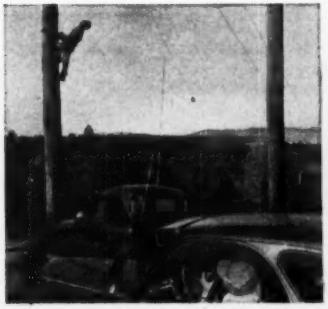
HIGH TENSION transmission lines in the South Dakota mountains presented difficult maintenance problems to the Black Hills Power and Light Company at Rapid City. Snow and high winds made land line communication impractical. General Electric's CAS* engineers solved the problem and cut the cost of the whole operation in half.

Today, 2-way radio carries voice messages instantly throughout the system. Ten General Electric land stations and 28 mobile radio sets in cars, service trucks, line trucks and power wagons, keep communications open 24 hours a day the year 'round.

The CAS* Man at the G-E office near you is a specialist in communication problems. His information and help are as near as your telephone. *General Electric Company, Electronics Park, Syracuse, New York.*

**Communications Advisory Service*

Elevation 6800 feet. Terry Peak installation has General Electric control transmitter-receiver combination and 250-watt central station unit.



69 kilovolt structure is inspected by lineman on pole while Henry Ostreich, superintendent of construction, talks to headquarters by car radio.

G-E 50-watt unit in Osage power plant. Ed Geddes, chief engineer, places call to truck in motion 55 miles away via mountain-top relay.

Power plant control console links mountain transmitters with main station and office units. Utility plans to add more G-E radio as load grows.

Complete Communication Systems for Industry

GENERAL ELECTRIC

There's a *Low Cost* Westinghouse Demand Meter...

- for every circuit
- for every rate
- for every mounting!

Here are the answers to all your needs for less costly metering of kw and kva demand. It's a *complete* line of Westinghouse Demand Meters, engineered specifically to shave your specialized metering costs. In every case the designs are . . .

Simple . . . only a minimum number of moving parts. Block Interval types are used with standard Westinghouse Meters. Thermal demand elements are combined with conventional watthour meters.

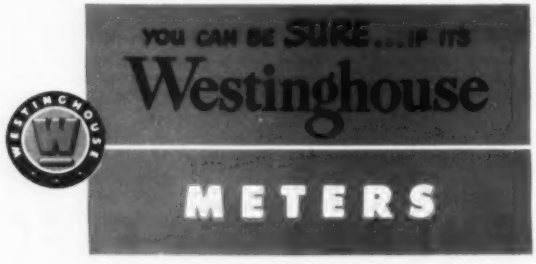
Compact . . . no larger than a 3-element watthour meter except for increased depth.

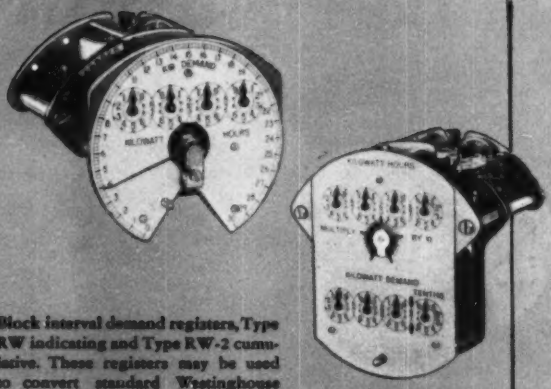
Easy to install . . . just one mounting for both watthour and demand meter . . . connections are interchangeable with standard watthour meters.

Easy to maintain . . . in all units you'll find the same low maintenance characteristics you enjoy in Westinghouse Standard Watthour Meters.

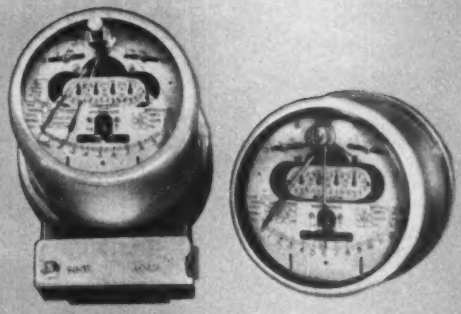
Specific examples of Westinghouse pioneering in pace with your needs include: the first polyphase, combination thermal unit in a socket base; the first and only combination polyphase watthour and thermal kva demand meter.

It is the kind of skillful, pace-setting engineering that stands behind every meter that Westinghouse builds today. It's another good reason to always specify . . . Westinghouse. J-40425



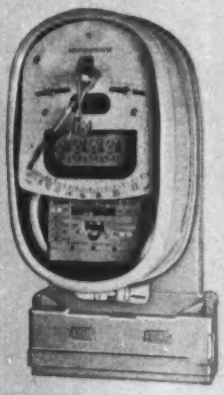


Block interval demand registers, Type RW indicating and Type RW-2 cumulative. These registers may be used to convert standard Westinghouse Watthour Meters to demand types.



CAH and CSH single-phase, combination watthour and thermal demand meters. In the Type CSH a 50-ampere meter with 48-kw (200-amp) full-scale rating is available.

CSH and CAH polyphase, combination watthour and thermal demand meters. CSH-8 is the first polyphase meter available for socket mounting.



KCA polyphase, combination watthour and thermal kva demand meters . . . available for all services under all conditions of current, voltage and power factor.

QCS and QCA single or polyphase, combination watthour and thermal ampere demand meters . . . available in all standard ratings.

GET COMPLETE INFORMATION...

Complete details, including operating and construction features, application information and wiring diagrams, are contained in individual catalogs covering each of the meters shown here. Ask your Westinghouse representative for copies or write: Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania.

Type RW (Indicating) Demand Registers . . . C.S. 42-315

Type RW-2 (Cumulative) Demand Registers . . C.S. 42-316

Type CSH and CAH (single-phase) Combination kw Demand . . . . . C.S. 42-337

Type CSH and CAH (Polyphase) Combination kw Demand . . . . . C.S. 42-338

Type KCA Combination kva Demand . . . C.S. 42-340

Among the things you take for granted...

The strong conviction instrument users hold for *measurements by* WESTON has its foundation in their own instrument experience . . . years during which WESTON instruments have given unfailing service . . . proved beyond doubt their unequalled precision, stamina and dependability. It is evident in the widespread preference shown for WESTON instruments for panel and built-in needs . . . where *so much* depends on the movement of a pointer. Regardless of the service . . . or the type, range or sensitivity of the instrument . . . truthful measurements and long, carefree service are *taken for granted.* Copy of panel instrument bulletin A7C gladly sent on request. WESTON Electrical Instrument Corporation, 617 Frelinghuysen Avenue, Newark 5, New Jersey . . . manufacturers of Weston and TAGliabue instruments.

WESTON *Instruments*

5360

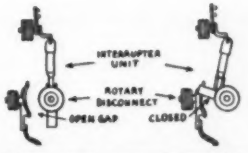
Increase SAFETY FACTORS at Load Centers with

R&IE INTERRUPTER SWITCHES

5 Kv., 600 Ampere wall-mounted Interrupter Switch used to transfer load without interruption. Housing at left—single switch; housing at right—two single throw switches, all hook operated.

1. Compact, easy to install, mounts anywhere—wall, transformer throat, etc.
2. Reliable load interrupter and open gap switch assembly, single or double throw.
3. Operating handle equipped with sequencing device to prevent opening of switch before it is fully closed. This guarantees proper interrupting operation.
4. Can be equipped with Kirk Key Interlock or Solenoid type system.
5. Can be arranged for fuse combinations above or below interrupter.
6. Furnished with or without housings—doors can be interlocked.

Wiring diagram shows the arrangement of two-position three pole switches illustrated above.



Plunger type interrupter quenches the arc when plunger is quickly drawn into a fibre lined tube. The two electrodes separate and arc is extinguished in the narrow space, causing interruption. Rotary disconnect establishes visible open gap.

R & I E EQUIPMENT DIVISION

I-T-E CIRCUIT BREAKER CO.

GREENSBURG, PA.

The Complete Line

CONDUCTOR SUPPORTS, CLAMPS AND FITTINGS

DISCONNECTING SWITCHES INDOOR AND OUTDOOR

HORN GAP SWITCHES

INTERRUPTER SWITCHES

CUTOUTS AND THERMO-RUPTERS

DISTRIBUTION EQUIPMENT

SWITCH OPERATING MECHANISMS

SUBSTATIONS

OPEN OR ENCLOSED, ISOLATED PHASE HEAVY DUTY BUSES

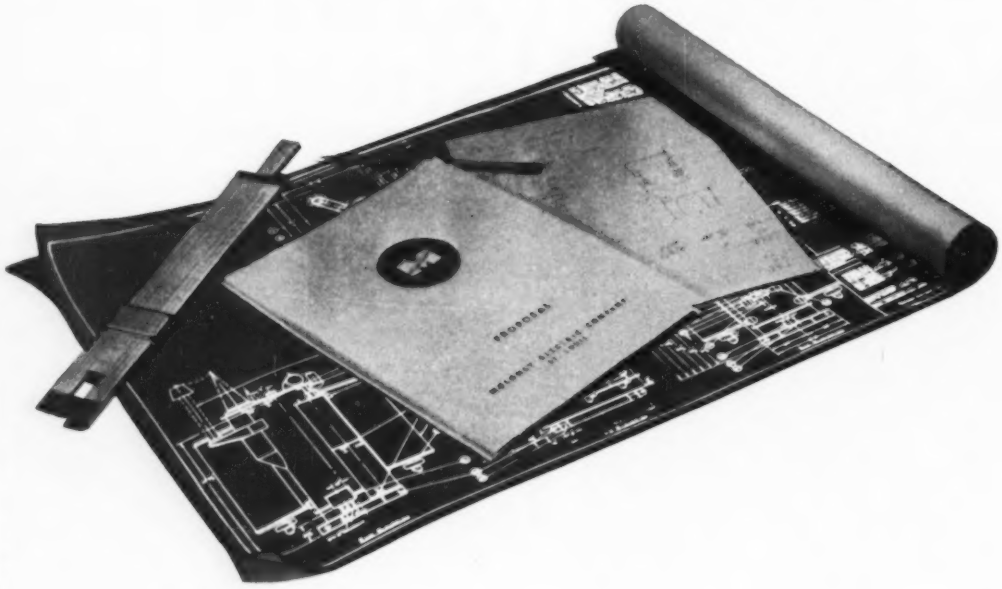
KIRK INTERLOCK SYSTEMS

AUTOMATIC SWITCHING EQUIPMENT

METAL CUBICLES

TESTING DEVICES

MOLONEY *Better Performance* is put in writing *FIRST!*



MOLONEY engineers put your specifications, plus over 50 years of engineering experience, into a formula *on paper* first.

This formula, followed through design and fabrication, results in a transformer, built to your needs, that is test-proven before it leaves our factory. Unexcelled experience, personnel and facilities all combine to give "Better Performance" when you specify Moloney Transformers.

ME 52-7

MOLONEY ELECTRIC COMPANY

Manufacturers of Power Transformers • Distribution Transformers • Load Ratio Control Transformers Step Voltage Regulators • Unit Substations

MOLONEY ELECTRIC = BETTER PERFORMANCE, GREATER RELIABILITY, LESS MAINTENANCE

SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS, MO. AND TORONTO, ONT., CANADA

The Risk of Regulation

The rapid expansion of the utility industry, and the accompanying technological progress, has tended to obscure what many believe to be a poor earnings position. So the question might well be asked, What will happen when the present rapid pace of expansion slackens and the industry has to face the problem of living at reduced operating levels? An important part of the answer lies in the regulatory process.

Can the courts and commissions honestly say that in setting rates of return they have paid heed to the words in their own decisions? Can they say that they have considered the following factors as specified in such pronouncements:

1. A proper rate of return is a flexible concept and not a static rule.
2. What return is proper necessitates the exercise of enlightened judgment in each case.
3. Current conditions are controlling, and general conditions affecting all business should be considered.
4. The return should be sufficient to assure confidence in the financial soundness of the utility, maintain its credit, and attract the required capital.
5. The propriety of the allowed return depends largely upon the circumstances, locality, and risk of the utility enterprise.
6. The return should be equal to that generally being made at the same time and in the same general region on investments in other enterprises which have corresponding risks.
7. The historical cost of money to the utility and the current cost of money should both be considered.
8. A utility's corporate structure, financial history, and past operations should be considered.
9. The return should reflect, among other things, due recognition of efficiency or lack of efficiency in management.
10. The future prospects of the utility, its taxes and development, the potential stimulation from reduced rates, and the character of the service should be considered.

Could all these factors have been considered in arriving at a rate of return of 5½% for a highly risky pipe line system or the assignment of 5-2/3% to a small, highly vulnerable, poorly diversified New England power company?

The best that most regulatory bodies would be able to say is that while they have considered all these factors they gave them little weight or probative value. It would appear then that all these court and commission decisions may be just so many empty words and that the greatest risk of all is the risk of regulation itself.

While commissions have often been at fault in the administration of the regulatory process, many utilities have been derelict in presenting their cases to commissions and to the courts. The adherence to the cost of money theory rather than to the rate of return and the insistence that the so called "informed investor" is capable of evaluating all the factors of risk to which the utility business is subject through his over-all judgment have opened a Pandora's Box of regulatory decisions which can only lead the industry down the road of financial embarrassment.

Before it's too late, utilities should insist, even through court action, that commissions live up to their obligations and give adequate recognition to the factors previously enumerated. Only by such action can the risk be taken out of regulation.

Fight and Cooperation

The approval by a U. S. District Court of the distribution of Washington Water Power Co. stock to the stockholders of American Power & Light Co. should be welcomed by the entire industry and all those who believe in private enterprise.

Washington Water Power Co. is free today because many persons in the industry were willing to fight and to cooperate. There is no doubt that Kinsey Robinson fought to keep his company. But he didn't fight alone. He had scores of allies. Newspapers, magazines, state and municipal officials, industry associations, labor unions, other companies, civic groups, and company stockholders and employees fought at his side. Electrical World likes to think that it too contributed a little of the ammunition and fired a shot or two.

For the industry this great utility company should always be a reminder that no battle is hopelessly lost no matter what the odds. Cooperation and fight often will bring victory. Let us hope this one will be an inspiration in other battles that may follow.

Business Needs a Better Index

To foretell the future has always been the goal of mankind. From the time of the Delphic oracles, through the auguries of Rome, to the forecasts of today's economists, man has constantly searched for the answer to the question, "What will happen in the future?"

Business does not seek the answer in the murmurings of a priestess in a trance or in the flight of birds. In their place business has substituted various indices based on data, calculated according to the laws of mathematics. Supposedly these modern methods are more scientific and accurate. But is this supposition true?

One, and probably the best, index is the Weekly Electric Power Output Report of Edison Electric Institute—though the institute makes no claim that the report is an index of business activity. This report shows how much electricity was distributed to the public. Because electricity cannot be stored, the report shows how much was used. Presumably when much is used, business is good; when little is used, business is bad.

There is some truth to these suppositions. A glance at the chart on Page 71 will bear out this. Note the sharp dips whenever a holiday occurs. Yet excellent and timely as is this report, it still lacks much of being an accurate and sensitive forecaster of business conditions.

The reasons are these:

1. The energy output of industrial power plants is not included.

2. Residential load which depends so much on the hours of daylight. Weather also distorts the curve.

3. Residential usage and customers have been increasing at such a rate that they often more than make up the decline in industrial sales from last year.

The steel strike has brought out the lack of sensitivity, and per se the weakness, of the output report as a business index. The strike started June 2. Throughout the month the only indication of this, the greatest steel strike in the nation's history, in the report was a slight decline from 1951 in the Central Industrial region. It was not until the week ended July 12 that a second region, the Middle Atlantic, went into a decline. At no time in June did the output report indicate that anything had popped up that could in any way depress business in coming months.

The reasons are those given previously. The big steel producers have their own power plants; so their lack of production was not reported. June and early July were extremely hot in most regions of the country. The astounding growth of air conditioning helped to conceal the dips in industrial consumption of energy. And the growing load provided by the some 1.8 million customers added since last summer contributed additional concealment.

But no index was sensitive enough to indicate accurately the changes in business activity. To fill this gap in our business indicators calls for the best efforts of the industry's statisticians. If one or a group of them can come up with a sensitive and accurate index, the industry and all business will have been done a great favor.

Share Ownership of American Industry

Eighty-two percent of all families in the United States or a total of 42 million families own life insurance, and a high percentage of insurance company funds is invested in public utilities. In addition to this indirect ownership 2.5 million persons own stocks of utility companies.

Those facts brought out in the survey of "Share Ownership in the United States" by the Brookings Institution have broad significance. They show more clearly than words can the stake that the people have in utilities. They show that if people were properly informed, there would be a much greater percentage favoring private ownership of utilities.

Now the savings and loan associations, trust funds, and pension funds are adding to the great pool of investment in utilities. In addition the survey finds that 16.8% of employees of public utility companies own stock in their company.

These facts point up the need for much more activity in the distribution of information direct to stockholders and bondholders. Since the majority of these people are indirect holders, some means must be found to have the story told by the direct holder whether it be an insurance company, pension fund, or savings association.

The insurance companies are the logical ones to select as pace setters in this activity. They should take the lead in protecting their investments by having well informed policy holders. Such programs will have to be stimulated by agencies of the utilities if a good job is to be done. We believe it is time for more activity in this and related fields where shareholders are involved.

Food for Thought

"Much of the friction between government and business is generated because of a failure to recognize that big government is here to stay and that learning to live with it, to criticize it effectively, and to control it are not only appropriate but mandatory." This statement (See news section) by Bayard L. England, president of Edison Electric Institute, will not meet with 100% approval by the industry. But certainly it should provide food for thought. Other executives may find that it contains the germ of industry policy.

THE ELECTRICAL WEEK

Featured in the News

82nd Congress, Second Session, spent most of its time cementing up previously established policy in regard to federal power (p 72) . . . They're building a state-wide grid in Iowa (p 74) . . . Big government is here to stay, says EEI's England (p 75) . . . Consolidated Edison is laying its first tie line to Staten Island Edison Corp, a subsidiary (p 76) . . . "Buy American" policy is being relaxed by the federal government (p 77) . . . Iowa companies are cool to setting up of a public utilities commission in the state (p 78) . . . Britain appropriates $350,000 to develop the cross-channel cable (p 80).

• • •

Latest from Washington—Prime construction contracts for expansion of two AEC gaseous diffusion plants were awarded to Maxon Construction Co, Dayton, Ohio, and F. H. McGraw & Co, Hartford, Conn. Contracts amount to about $460 million each . . . FPC has granted a license to Oreville-Wyandotte Irrigation District of Oreville, Calif., for a proposed $26-million hydro development on south fork of Feather River . . . Government experts figure steel shutdown has already caused the loss of some 20 million ingot tons of steel . . . Interior Department has promoted E. G. Nielsen to regional director of Reclamation Bureau's Region III with headquarters at Boulder City, Nev. . . . NPA has temporarily lifted its restrictions on amount of aluminum and copper products which an electric utility may carry in its inventory . . . Air conditioning and TV were credited with helping Potomac Electric Power set a new record peak load. Highest load ever carried by PEPCO came in mid-afternoon last Monday just as Democratic convention got underway and while Washington temperatures were in mid-nineties . . . Showdown on USBR spending is brewing as Rep Clair Engle (D-Calif.) awaits legal opinion from comptroller-general and attorney general on whether bureau violated law in overcommitting an authorization by about $3.4-million.

Democratic National Convention—Interior Secretary Oscar Chapman was on hand in role of an observer for the President. He never has given up idea that he is vice-presidential timber . . . SEC Chairman Donald C. Cook was working behind the scenes in Chicago for his own choice . . . There was no reluctance on part of Democratic politicians to talk up their advocacy of federally owned power facilities. National Democratic Committee Chairman McKinney dwelled on the subject. Keynoter Paul Dever accused the Republicans of letting free enterprise develop electric power, and warned the same would be true of atomic energy if the GOP takes over.

From the Southeast—After 19 months of negotiations, federal government and Virginia E&P agree on terms for purchase of power from John H. Kerr (Buggs Island) Dam, near Clarksville. Company officials hope to meet shortly with Southeastern Power Administration to sign final papers, Pres Jack H. Holtzclaw says.

From West North Central—Northwest Iowa rural electric cooperatives work out plan to build 621 miles of 69-kv line for getting their share of government-produced power from Bureau of Reclamation's Missouri Basin power projects.

From Mountain Area—Nevada took another step toward purchase of Shasta Dam power at Carson City meeting when Bureau of Reclamation tentatively agreed on a contract to make a limited amount of power available if the state can find a way to transmit it.

Construction—Rockland (N. Y.) L&P will expand its Tomkins Cove plant by 66,000 kw . . . Alabama Power puts on line 100,000-kw unit at Gorgas steam plant and 55,000-kw unit at Martin Dam, raising company's capacity to 1,129,500 kw.

Financial—Dallas P&L gets Dallas City Council approval to buy Texas P&L system serving Lake June area for $348,501. TP&L will buy from DP&L lines in Shiloh-Kingsley-Jupiter Road and Barnes Bridge-Oates Drive areas which recently were annexed by Garland.

Franchises—Milford, Del., City Council votes 6-to-2 to adopt 10-year contract with Delaware P&L which calls for a sliding scale of rates that will mean a saving to city in the purchase of current. It also means that city can do as it desires with obsolete municipal plant and still receive a yearly bonus of $9,000 . . . Montgomery County Council, Md., proposes ordinance granting five-year franchise to Potomac Electric Power which requires PEPCO to pay county $100,000 yearly in place of 3% franchise tax. PEPCO has 30 days to decide.

Public Relations—Alex Beebe, president, Rochester G&E, will serve as acting chairman of Production for Freedom Committee during vacation of Clint Spurr, president, Monongahela Power . . . PIP has organized Southwest Region with Don Kennedy, president, Oklahoma G&E as chairman and Beeman Fisher, Texas Electric Service vice president, secretary. The 12-company group will meet Aug. 22 at Oklahoma City.

Rates—Eastern Shore Public Service gets Maryland PSC approval to up rates 10.14%, effective Aug. 1 . . . Delaware P&L will put into effect about 10% rate hike in Kent and Sussex Counties as of August meter reading, after posting a $50,000 surety bond with PSC while awaiting commission's decision on higher rates.

Nation's first Reddy Kilowatt farm, Pennsylvania P&L's designation for a 100% electrified farm, will be dedicated Aug. 6. National and state farm leaders will attend. This farm, located north of Sunbury, is expected to be but the forerunner of many others in the United States and Canada.

Congratulations—Philip Torchio, Jr, is new commercial vice president of American Gas & Electric Service Corp.

WASHINGTON COMMENT

JESSE MOCK

Federal power policies may change slowly as a result of the November presidential election, but there is prospect of an extensive shake-up among the government policy-makers.

Republican candidate, Dwight D. Eisenhower, who has not yet spelled out his views on the government's role in power development, promises to "dispose of everybody in an appointive position."

Democrats have not finished their balloting at this writing, but there appeared a strong likelihood their nominee will sponsor a widespread reshuffling in the top echelon of the executive departments. Any nominee can be expected to make a few changes in the men who run the government's various electric power programs.

It's the Interpretation That Counts . . . Thus while the present written power policy may change but slightly, there is a strong chance that it will be administered differently. As many utility officials know, there is plenty of administrative leeway in the laws dealing with electric power. The policy-makers are in a position to call the plays on just how the law is to be applied.

For instance Interior Secretary Oscar Chapman could have accepted the Federal Power Commission decisions to issue licenses to electric companies for the Roanoke Rapids and Kings River projects. Instead, he has chosen to fight these licenses in court. Chapman could have also awaited an FPC decision on development of the Snake River in the Hells Canyon area. Instead, he has taken the offensive in attempting to get Congressional approval of a government-financed Hells Canyon project.

While Chapman has not been notably successful in any one of these fights, he has prevented clear-cut decisions from being made.

Republicans In, Chapman Out . . . The November election will probably decide just how long Chapman will retain his present position. If the Republicans win, he is out. If the Democrats win, there is still a chance that he will be out.

A long list of government officials dealing directly with electric power matters are in the same boat with Chapman. They are either Presidential or secretarial appointees.

Among those Interior officials subject to replacement would be: the Undersecretary and Assistant Secretaries, Commissioner of Reclamation Michael Straus, Southeastern Power Administrator Charles W. Leavy, Southwestern Power Administrator Douglas G. Wright, Bonneville Power Administrator Paul J. Raver.

At the Agriculture Department there is Rural Electrification Administrator Claude Wickard who would be subject to replacement. There is the possibility that one or more of the Tennessee Valley Authority directors would be replaced.

The regulatory agencies are in a different category. All but two of the present members of the Federal Power and Securities and Exchange Commissions are serving term appointments. However, the President does have authority to designate the chairman of both commissions. Chairman Thomas Buchanan of FPC is serving under a recess appointment, and this could be set aside by a new President who would nominate a new member. Newest member of SEC, J. Howard Rossbach, is also serving under recess appointment subject to cancellation by a new President.

In the case of either commission, a new President might designate one of the present members as chairman or set aside the recess appointments to bring in a chairman of his own choosing.

In every election year top federal policy-makers face the prospect of losing their positions. It is an occupational hazard that they most certainly realize.

TECHNICAL NOTES

ARCHER E. KNOWLTON

Sulphation of battery plates is often attributed to imperfect circulation of the electrolyte.

Butyl gum for electrical applications is composed of polyisobutylene (97 to 99%) plus isoprene (1 to 3%) necessary for vulcanization.

Hip-roll back-pressure resuscitation is less fatiguing to the rescuer than the hip-lift back pressure method but more so than the arm-lift or Schafer methods.

Depth-finder using electronic sonar and no boring has been used successfully to locate the level of bed rock under deep silt deposits in Chicago harbor.

Ultraviolet and infra-red rays are both produced by a new Dutch lamp of solar-spectrum characteristics.

Temperamentally inept station and system operators are as much out of place as linemen who cannot climb poles.

Pulverized-coal is facing some competition from crushed coal burned on spreader stokers at the lower range and cyclone firing at the upper range of ratings.

Aluminum will be used for the windings of the 68-Mva transformers to be installed at a Canadian outdoor hydro plant of 200,000 horsepower.

Non-homogeneity and non-uniformity of gradient are usually indexes of inefficiency. Both are characteristic of the combustion space in the best of modern boilers. Improvements in combustion, in turbulence, in rate of heat absorption could conceivably add as much to boiler efficiency as reheat contributes to the cycle thermodynamically.

Imported trouble man inadvertently hooked a storm-interrupted customer up to the traffic light circuit. He saw red, intermittently.

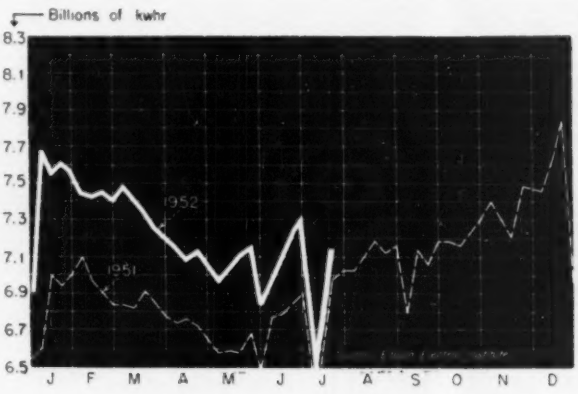
Bicycle-pump testing of 22-kv cable joints with 10 or 12 psi could conceivably introduce moisture into the insulation.

Power circuits act as a lightning and tree-limb umbrella over telephone circuits on the same poles.

Single channel radio can become jammed with glut of messages under storm emergency when telephone may also be out of commission.

Operating engineers can incur far more anxiety if new and untried gadgets are thrust upon them by their designers than if they are assigned to reheat operation.

STATISTICS



Output Week Ended July 19—7,180,328,000 Kwhr

Per Cent Change From Previous Year

	Total US	New Eng.	Mid. Atlan.	Cent. Ind.	West Cent.	South-east	South Cent.	Rocky Mount.	Pacific NW	Pacific SW
July 19	+3.0	+4.9	+1.2	—4.4	+4.2	+10.7	+9.5	+4.8	+2.1	+3.2
July 12	+3.7	+10.5	—0.2	—2.6	+5.3	+9.4	+13.6	+3.8	+3.9	+3.3
July 5	+6.7	+9.5	+2.5	+0.8	+10.1	+13.6	+18.6	+6.5	+7.1	+3.4

Electric Power Statistics

		Latest Month	Preceding Month	Year Ago
Peak Load (Million Kw)	Apr.	64.8*	66.5	60.4
Capacity (Million Kw)	May	77.01	76.74	71.35
Production (Billion Kwhr)	May	31.82	31.51	29.87
Hydro		9.69	9.96	8.54
Fuel		22.13	21.55	21.33
Fuel Consumption				
Coal (Million Tons)	May	8.01	8.05	7.99
Oil (Million Barrels)		3.72	4.20	4.51
Gas (Billion Cu Ft)		76.99	66.50	70.57
Sales (Billion Kwhr)	Apr.	28.33	29.03	26.68
Residential		7.91	8.32	7.12
Commercial		4.74	4.85	4.39
Industrial		13.85	13.98	13.17
Other		1.83	1.87	2.00
Net Income Class A & B Companies ($ Million)	May	68.24	75.82	60.80
Estimated Dec. 52 Peak (Million Kw)	Apr.	80.3	80.4	78.7
Kwhr per Residential Customer (12 Month Average)	Apr.	2,066	2,053	1,898
Revenue per Kwhr Residential Service (12 Month Average)	Apr.	2.79¢	2.79¢	2.85¢
Canadian Production (Billion Kwhr)	May	5.33	5.03	5.13

Business Statistics

FRB Industrial Production Index†††	June	203*	215	223
Gross National Product Annual Rate ($ Billion)	1stQtr.	339.0	334.6	319.5
E. W. 5 Industry Production Index	June	96.9*	116.0	122.2
ENR Construction Cost Index††	July	119.6	117.8	113.7
BLS Consumer's Price Index	May	189.0	188.7	185.4
NEMA Insulation Materials, Sales Index†	May	517	545	614
NEMA Electric Appliance Sales Index†	May	219	221	296
NEMA Household Refrig. Sales Index†	May	132	133	183
Metal prices (July 21)				
Copper, Conn. V., lb		$ .24½	$ .24½	$ .24½
Lead, N. Y., lb		.16	.15	.17
Zinc, prime Western E. St. Louis, lb		.15	.16	.17½
Tin, Straits, qual. N. Y., lb		1.21½	1.21½	1.06
Aluminum, ingot, base price		.19	.19	.19
Nickel, base price		.56½	.56½	.56½
Steel, billets, Pitts., ton		56.00	56.00	56.00
Steel, scrap, No. 1 heavy, Pitts., ton		45.00	45.00	45.00

* Estimated. † 1936=100 †† 1949=100 ††† 1937-39=100 (Unadjusted)

Industrial Purchases of Fuel & Electricity

Census of Manufactures data recently released by Department of Commerce reveals these two facts:

1. During the four years, 1947 to 1950, purchases of electricity by industry increased $273.8 million, an increase of nearly 30%.

2. Nearly 30¢ of each dollar spent for fuel and electricity during 1950 was spent for electricity. In 1947 only 28½¢ of the manufacturers' "energy dollar" was spent for electricity.

Plants of the primary metal industries have increased their purchases of electrical energy $63.1 million.

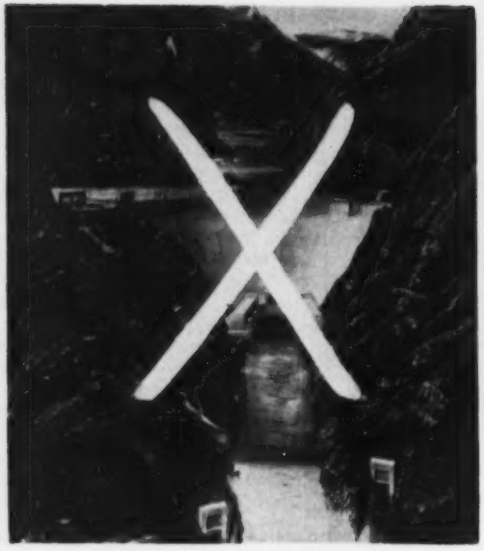
Plants of the primary metal industries are the nation's top buyers of both electrical energy and fuel. Only 15¢ of each dollar that the manufacturing plants of this group spend for energy is for electricity.

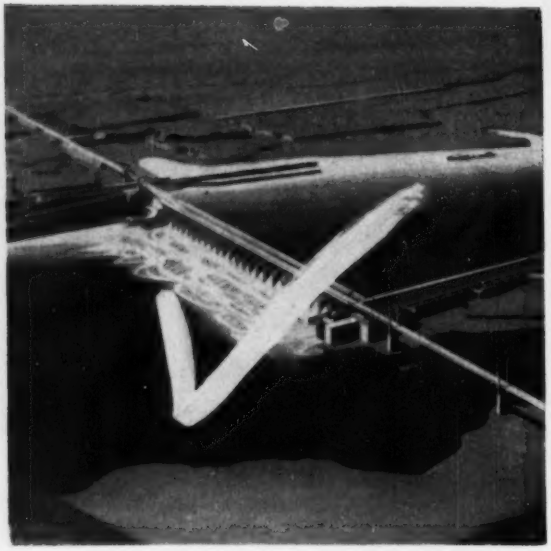
Industrial Purchases of Electrical Energy

	$ Million 1950	1947	% Inc.
Primary Metals Industries	251.9	188.8	33.5
Food & Kindred Products	136.2	108.5	25.5
Chemical & Allied Products	117.1	85.4	37.1
Textile Mill Products	104.1	82.5	26.2
Machinery (except electrical)	81.5	72.0	13.2
Transportation Equipment	77.4	59.2	30.7
Stone, Clay & Glass Products	72.8	54.9	32.6
Fabricated Metal Products	69.2	54.0	28.1
Paper & Allied Products	61.2	50.6	20.9
Electrical Machinery	44.1	34.6	27.5
Petroleum & Coal Products	36.1	28.3	27.6
Lumber	31.9	20.0	59.5
Printing & Publishing	28.8	24.0	20.0
Rubber Products	27.9	24.7	13.0
Apparel	26.7	20.6	29.6
Furniture & Fixtures	17.1	11.7	46.2
Leather & Leather Products	9.9	8.8	11.0
Instruments	8.3	6.8	22.1
Tobacco Manufactures	2.6	2.2	18.2
Miscellaneous	23.6	17.5	34.9
Manufacturing Establishments of All Industries	1,228.5	954.7	28.7

Industrial Purchases of Fuel & Electricity—1950

	$ Million Fuel & Elec.	Elec.	% Elec.
Primary Metal Industries	1,672.7	251.9	15.1
Food & Kindred Products	330.7	136.2	41.1
Chemical & Allied Products	370.4	117.1	31.6
Textile Mill Products	199.3	104.1	52.1
Machinery (except electrical)	166.8	81.5	48.8
Transportation Equipment	154.4	77.4	50.1
Stone, Clay & Glass Products	309.3	72.8	23.5
Fabricated Metal Products	138.8	69.2	49.8
Paper & Allied Products	235.6	61.2	25.9
Electrical Machinery	77.8	44.1	56.7
Petroleum & Coal Products	144.4	36.1	25.0
Lumber	98.8	31.9	32.2
Printing & Publishing	47.9	28.8	60.0
Rubber Products	51.0	27.9	54.6
Apparel	39.4	26.7	67.9
Furniture & Fixtures	28.7	17.1	59.5
Leather & Leather Products	25.2	9.9	39.2
Instruments	16.3	8.3	51.1
Tobacco Manufactures	7.7	2.6	34.0
Miscellaneous	43.1	23.6	54.7
Manufacturing Establishments of All Industries	4,158.2	1,228.5	29.5





Nothing for Hells Canyon . . . but $20 million for The Dalles

Congress in 1952 Left Basic Power

This year the federal legislators:

- **Approved Atomic Energy Commission expansion requiring an additional 4 million kw by 1957.**
- **Strengthened policy restricting government construction of transmission lines.**
- **Turned down requests for funds to begin four large hydroelectric projects.**
- **Investigated and will report on some power phases of government construction agencies.**
- **Provided most of money requested for federal government's routine construction and operation of power projects.**

Now that the 82nd Congress has quit Capitol Hill for campaign battlegrounds, we can stand off on a high dam somewhere and survey what its Second Session accomplished in regard to the federal power program.

First thing apparent is that the Congressmen left basic power policy pretty much as they found it. They did not leave it static—Congressional votes approved expansion of the federal government's generating capacity by several million kw.

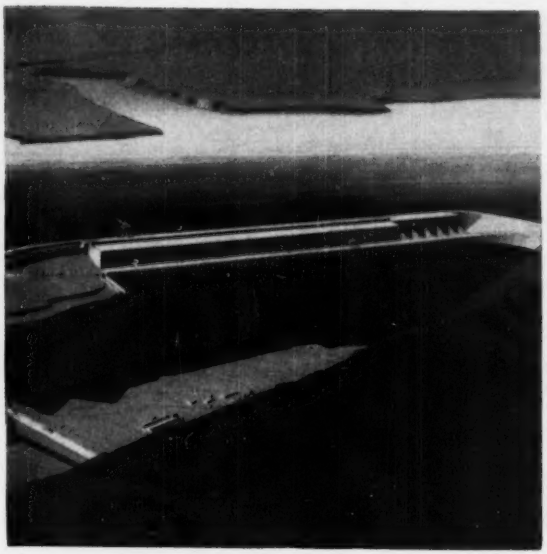
With Congressional approval, Atomic Energy Commission moved into its own as a major factor in power generating expansion—both public and private. AEC's ever-increasing role as a power consumer is responsible for a large chunk of the power expansion which Congress directly and indirectly authorized.

To meet additional AEC requirements, Congress voted money which will permit Tennessee Valley Authority to add another 1.7 million kw steam generating capacity to its system.

Congress also voted AEC funds to enter into contracts with electric company groups which will require installation of some 2 million kw. The House wanted to give electric company groups an even larger share of the AEC power market by cutting TVA requests some $65 million, but the Senate rejected this with the approval of House conferees.

Electric companies offered to supply the great bulk of the power AEC will need for its stepped-up program, but AEC apparently preferred to divide the market its own way.

Congress handed President Truman a licking on his attempts to gain approval for four large hydroelectric projects—at least three of which are highly controversial. These were the St. Lawrence power project on the New York-Canadian border, Hells Canyon project in Idaho, Ice Harbor Lock in Washington, and the Hartwell Project on the South Carolina-Georgia line.



indicates that . . .

Policy Unchanged

Concession . . . On the Hartwell project, Congress did authorize AEC to make a $250,000 study to determine its importance to the Savannah River hydrogen bomb materials plant.

Generally Congress followed a policy of "no new starts" but did make exceptions in the case of the AEC expansion program and several smaller reclamation and flood control projects.

On policy matters, the law-makers moved cautiously. It was more a matter of nailing down policy already made. Even this was confined to government construction of transmission lines.

Congress strengthened its restrictions on government transmission line construction for both Southeastern and Southwestern Power Administrations. It told Sepa not to spend mony on transmission construction until it had exhausted every effort to enter transmission contracts with electric companies. Further, Sepa must inform Congress of its inability to negotiate contracts before the money is to to be available.

Sepa Contracts . . . In Senate debate it was indicated that Congress would accept transmission contracts less stringent than those now sought by Interior Department, which is Sepa's parent agency. Georgia Power Co has offered to transmit government-produced power to preference customer on its own lines, but has balked at becoming the mere carrierboy for Sepa. Georgia Power wants to retain its present company-customer relationship. Senate clarification of the Sepa funds bill indicates that may be acceptable to Congress.

As for SPA, Congress voiced the hope the agency will quickly conclude its power exchange contract with 12 electric companies in its area. The contract, would provide the transmission facilities and firming power needed by SPA.

In general, Congress went along with routine construction and operation of government power projects. Projects already underway fared pretty well. For instance, $20 million was provided for continued construction of The Dalles Lock and Dam on the Columbia River—up from $4 million provided last year. Gavins Point Reservoir in Nebraska received $7.7 million this year—up from $2 million last year.

Power Actions . . . Other actions in the power field taken during the recent session included:

● A special civil works subcommittee held hearings and will make reports concerning cost allocations of multipurpose projects. The reports may have a bearing on power rates of government-produced electricity.

● The Senate Interstate and Foreign Commerce Committee shelved confirmation of Thomas Buchanan for reappointment as chairman of the Federal Power Commission.

● Two opposing resolutions calling for investigations were lost in the shuffle and never received committee consideration:

The first, introduced by Rep George Dondero, Michigan Republican, requested an investigation of the Electric Consumers Conference which met in Washington May 26. This was a public power group.

Second was a joint resolution introduced by Sen Warren Magnuson, Washington Democrat, which would have directed Federal Trade Commission to investigate the electric industry.

● Congress passed a law which will permit government agencies to grant rights-of-way 400 feet wide across public lands for construction of transmission lines. Previously, the width limit had been 200 feet.

There were just five key roll call votes on matters involving electric power development. The three Senate roll calls:

Approved 43-40 a motion to recommit the St. Lawrence Seaway measure to committee, which had the effect of killing the measure for the session.

Defeated 36-31 an appropriation bill amendment which would have reduced TVA funds by some $45.7 million for fiscal 1953.

Approved 45-25 an amendment which would have provided $900,000 for survey of Niagara power development. A conference committee later reduced this to $100,000.

House Cuts . . . In a less generous mood, the House cast the following roll-call votes on electric power measures:

Approved 199 to 159 an amendment which would have reduced TVA funds by $14 million for fiscal 1953. This cut was restored by the Senate and accepted by a House-Senate conference committee.

Rejected by a vote of 298-159 an amendment which would have provide funds to begin construction of a Reclamation Bureau 230-kv transmission line from Missouri River Basin projects into western Minnesota. This action was upheld in final Congressional action.

Transmission Grid Is Planned for Iowa

Eight utilities will build a 161-kv network 1,259 miles long at cost of $38 million

Eight major electric companies of Iowa are planning a $38-million high-voltage transmission grid which will be a step in a power pool and generation system that is estimated will cost $268 million by 1965.

Sutherland Dows, Cedar Rapids, president of both the Iowa Utilities Association and the Iowa Electric Light & Power Co disclosed the plans and said the companies have agreed as to initial construction phases of the grid.

The completed grid will be a network of 1,259 miles of 161-kv electric lines in addition to 356 miles of line now in use.

Private Financing . . . All financing for the transmission grid and the new generating facilities will be done by private investors and will make no use of federal funds.

The Iowa grid will link the eight major companies of Iowa which produce about 85% of the state's electric energy.

Participating companies will be: Iowa Public Service Co, Iowa Power & Light Co, Iowa Electric Light & Power Co, Interstate Power Co, Iowa-Illinois Gas & Electric Co, Iowa Southern Utilities Co, Union Electric Power Co, and Peoples Gas & Electric Co.

Central dispatching offices will control the flow of power over the lines. Generating loads at each station would be coordinated so that customers of the grid companies would get the advantage of the cheapest power and fuel available.

Better Service . . . The interconnection will provide better service during emergencies because any of the companies will be able, if necessary, to draw upon the reserve generating capacity of all the others.

The central dispatching offices will have instant communication with all generating stations in the grid by means of voice phone on "carrier current" channels over the transmission lines, and other such carriers will transmit continuous reports of production and demand in each of the cooperating company systems.

The net maximum hourly load (estimated) for Iowa companies during 1952 will be nearly 900,000 kw.

Executives of the participating companies predict the interconnection will combine with generation additions to meet Iowa's future power needs.

Work Has Begun . . . Work already has begun on two lines that will become a part of the grid system. Iowa Public Service has begun a line from Sioux City to Fort Dodge where it will connect with the present 161 kv line of the Iowa-Illinois Gas & Electric. Iowa Power & Light has received authorization and is preparing work on a similar line which will connect with the existing 161-kv line at Clarinda. The new line will extend from Clarinda to the 44,000-kw station under construction and Council Bluffs, and then to Avoca.

Engineers consider the interconnection plan as a "modernization" of electric transmission in Iowa. A survey of the state's anticipated power needs indicates an investment of $230 million in new generating stations will be required to meet demands expected by 1965. Power companies now have projects totalling more than $100 million underway.

New Lines . . . The initial phase of the grid construction calls for new lines, in addition to those under construction, from Fort Dodge to Iowa Falls and on eastward to Dubuque; from Iowa Falls north to Mason City and then on to Albert Lea, Minn., and from Oelwein north to near Decorah, making 575 miles of new line.

An additional 684 miles of grid will provide for transmission links from Sioux City southeast to Avoca and then east to Des Moines; from west of Storm Lake north. From north of Mason City east to Decorah; north from Keokuk to either Iowa City or Davenport; from Iowa Falls to Marshalltown. Another line would connect the new Iowa Southern Utilities plant at Eddyville into the grid at Des Moines or Searsboro.

Two east-west and three north-south routes have been outlined. Interconnection of the companies under the planned grid would permit power to be fed into any section of the state from at least two directions.

Use of Present Lines . . . The grid would utilize 356 miles of existing 161-kv lines which extend from Davenport to Des Moines. A leg of that system extends from Des Moines to Fort Dodge, and another from Des Moines to Clarinda, Iowa, and then on to St. Joseph and Kansas City, Mo. A 115-kv line from Cedar Rapids to Boone also would be incorporated into the statewide system.

When Missouri river hydroelectric power becomes available, the grid will be ready to make connections at Sioux City and other points to transmit such power to Iowa users.

Big Government Here to Stay . . .

. . . says EEI president at Michigan course for executives. The industry, he adds, must revise its thinking to fit this fact

"Much of the friction between government and business is generated because of a failure to recognize that big government is here to stay and that learning to live with it, to criticize it effectively and to control it are not only appropriate but mandatory."

Bayard L. England, president of Edison Electric Institute and Atlantic City Electric Co, made this comment at a dinner session of the second annual Public Utility Executive Program which was held at the University of Michigan.

Constructive Alternative . . . The electric companies, England said, have put up a strong factual program against further government expansion. But the time has come, he added, when a change in approach must be made to that used by the 15 private utilities in offering 2.2 million kw of capability to the Atomic Energy Commission to be built with private funds at private risk by companies prepared to pay taxes.

"The interesting aspect of this positive demonstration of the vitality and flexibility of private enterprise," he said, "is the fact that it represents an even more ambitious proposal than the earlier pioneering 650,000 kw Joppa, Ill., project (of Electric Energy, Inc)."

In utility finance, England said, the era of "fair return on fair value" has generally passed, regardless of lip service rendered to it by courts and commissions.

Utilities are probably committed to an accounting rate base and a managed and dictated rate of return. The job ahead, he said, is to see to it the return is more than the bare cost of capital.

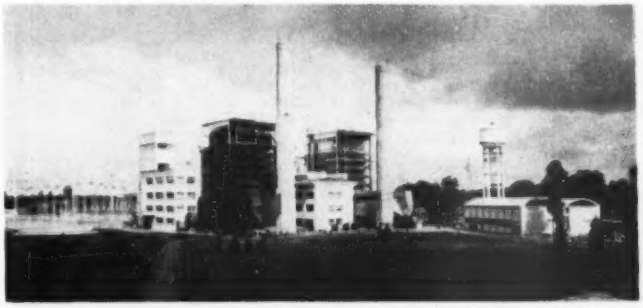
No Tragedy . . . "I think we made a mistake in predicting tragic results, "he said," when we should have recognized that all that had happened was a compulsion to think harder. We haven't become bankrupt but no one can deny that our financial problems have increased. We must compete, as we should, in the market place for funds to finance our expanding needs."

The utility executive of the 1950's, England commented, is forced to pace his thinking to a new condition in which state and federal regulators have become sophisticated and able examiners.

"Commissions which are considered pliable or weak are not the friends of the utility industry as assumed by many," he pointed out. "A weak commission is a constant threat to stability. It invites violent public reaction and the sophisticated purchaser of utility securities will shun the companies in such a jurisdiction or demand a high price for the obvious risks of public demands for more vigorous regulation."

Hall Cool, NPA Hot

Air conditioning at Convention Hall in Chicago for the national conventions made National Production Administration officials hot under the collar. While the officials undoubtedly could not dispute the need for air cooling during the politically hot sessions, they were put out that the necessary equipment was installed without government approval for the materials used—about 40 tons of steel and 1,100 tons of copper.



Italy Builds 1st Gas-Fired Plant

Italy's first steam power plant to burn natural gas was dedicated last month. Societa Termo Elettrica Italiana's Tavazzano Plant near Milan also is the first Economic Cooperation Administration-sponsored project to combine the cooperation of American and European engineers and manufacturers.

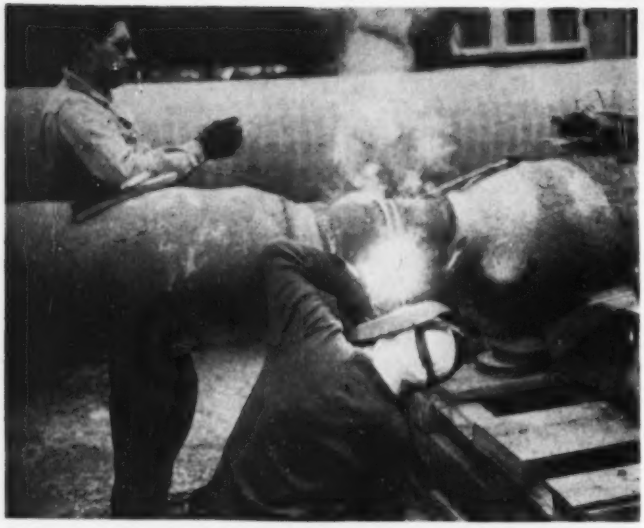
Outdoor Features . . . The power station has two 62,500-kw turbine-generators. Its two entirely outdoor boilers, first in Europe, are of the reheat type, each delivering 475,000 lb of steam per hour at a temperature of 970 F and a pressure of 1,850 lb psi. This is the highest steam pressure yet used in Europe for such purpose.

Designed, planned, and erected by the engineering department of Montecatini Corp, one of STEI'S holding companies, the new power plant contains generators and auxiliary equipment manufactured in Europe and steam generating equipment and controls made in the United States.

Tavazzano Plant marks an important step forward for the Italian economy, so far exclusively dependent on foreign fuel. The plant, located in the industrial heart of the country, will burn natural gas from newly developed wells in the nearby Po Valley.

ECA Helps Out . . . Because of lack of fuel Italy's electrical industry is based almost entirely on hydro power. Destruction of power plants during World War II and several consecutive years of drought made the power situation critical. These conditions prompted ECA to make possible the construction of steam plants.

The first European power plant was built at Milan. It was designed and manufactured by Thomas A. Edison in 1882, at the same time New York's Pearl Street Station was being constructed.



WORKMEN are shown welding a 1½-mile, continuous steel pipe containing 138-kv compression cable installed by Phelps Dodge Copper Products Corp. Pipe will be drawn under The Narrows, making the first tie between Consolidated Edison Co of New York and its subsidiary, Staten Island Edison Corp.

Laying Tie Line Under Hudson

Twin power lines which Consolidated Edison Co of New York is installing under the Narrows from Brooklyn to Staten Island will permit interchange of power between the two boroughs for the first time.

The lines will carry power at 27 kv from Con Edison's Hudson Avenue Plant in Brooklyn to the distribution system of its subsidiary company, Staten Island Edison Corp. Power can be wheeled in the other direction if Con Edison's long-range plan to build new generating facilities in Staten Island materializes. The cables will be capable of carrying 138 kv if necessary.

Pulling Begins . . . A giant winch on the Brooklyn shore began pulling a steel pipe-type conduit assembled in 1,000 ft lengths on the Staten Island shore on July 17. Crews worked day and night welding each section of pipe to pipe already in the water.

Con Edison engineers estimated it would take several weeks to pull the two separate pipes across the 6,700 ft span. The installation of electrical conductors in the pipes is expected to be completed by Labor Day.

The Con Edison cables will make use of the same trench below the Narrows as the natural gas pipe line laid by Transcontinental Gas Pipe Corp, Houston, Tex. The trench, about 40 ft wide, goes down 30 ft below the channel bottom, a depth which will provide protection from marine traffic above.

The interconnection will consist of two oil-pressure pipe-type cables. Each cable will be made up three insulated conductors encased in an oil-filled pipe. The steel pipe, nearly 9 inches in diameter, is heavily coated with somastic—an anti-corrosion compound —and reinforced concrete.

Load Spreading Slated to Continue in Britain

Load spreading will continue in Great Britain this winter in spite of increased generating capacity and an easing of industrial demand for power. The government is asking industry to reduce its consumption at peak periods 10% from Nov. 1 to Jan. 31, '53.

These measures are less severe than those in effect last winter when a 20% cut was asked over a five-month period and staggered work hours called for where possible.

The deficit for this winter is put at 1,000 Mw in average weather.

Quake Loss Light

Pacific G&E hardest hit of California utilities; other firms report minor damage

Moderate to light damage was experienced on electric power facilities in the Tehachapi-Mojave Desert area struck last Monday morning by the severest earthquake in California since the San Francisco quake in 1906.

The quake rocked the area from San Francisco to the Mexican border inland to Nevada and left the little town of Tehachapi almost leveled in its wake.

Pacific Gas & Electric Co's San Joaquin division north of Tehachapi in Kern County appeared the hardest hit. Of two turbines at Kern Steam Plant in Bakersfield taken off the line when the quake began one was back in service by mid-afternoon. The other was being tested for excessive vibration. A water tank came down at Midway Steam station in Buttonwillow.

Substations Damaged . . . Four distribution substations were damaged and service was disrupted until load was picked up by other stations. At several 60-kv substations 11 transformers were tipped over. An 11-kv switchrack was twisted and leads torn loose at Old River substation. About 100 distribution transformers in the division were shaken to the ground.

Transmission lines and power stations of Southern California Edison Co were reported undamaged, although the quake caused widespread outages because of damaged distribution facilities. The area around Tehachapi is served by Edison.

Los Angeles Department of Water and Power had some 70 interruptions on primary distribution lines, but expected to have all service restored by noon. Two earth-fill dams on the department's aqueduct to the Owens River in the Sierra Nevada mountains had slight cracks but no leakage was reported.

No damage was reported on two transmission lines of California Electric Power Co which run from Riverside through the Mojave Desert to the east slope of the Sierra Nevada mountains. The company suffered some damage to distribution lines which it termed widespread but minor.

'Buy American' Policy Relaxed

First real sign of the trend comes with the decision by the Army to accept British bid only 20% under American

First real sign that the federal government is relaxing its interpretation of the 1933 "Buy American Act" came recently when Department of the Army awarded a large contract for heavy electrical equipment to a British firm.

In the past, government agencies have held that foreign suppliers must beat American bids by at least 25% to qualify for a contract award. Differential between the low American bid and the winning British bid in this latest case was only about 20%.

The 1933 act is designed to protect American firms from foreign competition by requiring the government to make its purchases from American business. However, department heads or heads of independent agencies may set the provision aside if they find it is inconsistent with the public interest or that costs are unreasonable.

Army Accepts . . . The Army Department July 16 announced it had accepted the low bid of Ferranti Electric, Inc, for nine British-made 33,333-kva power transformers. This equipment is to be used by the Army Corps of Engineers for installation in the Garrison Dam project near Bismarck, N. D. Low bid submitted by a U. S. firm was $1,357,500, by Allis-Chalmers Manufacturing Co.

This is the fourth instance this year in which government agencies have either approved or awarded contracts for heavy electrical equipment to foreign firms. Bureau of Reclamation has made two such awards and Rural Electrification Administration has approved award of such a contract by one of its borrowers—the Alabama Electric Cooperative.

But in each of the previous cases, the bid of the foreign firm was at least 25% less than that of the lowest American bid. In the latest case the general 25% differential has been set aside. The Army hints that it is setting no precedent by accepting the Ferranti bid. For the future, it said, "each case will continue to be decided strictly upon its individual merits within national policy and applicable laws and regulations."

One for State . . . However, the contract award is generally seen as another small victory for the State Department and the Mutual Security Administration. Both State and MSA have, for months, been pushing a policy of more imports from friendly countries.

In June Undersecretary of Defense William C. Foster sent a memorandum to the secretaries of Army, Navy, and Air Force urging them to give more attention to possible purchase of goods from friendly foreign nations. Stated purpose of this memo was "to assure that proposed awards . . . will be evaluated in such a manner as to give due weight to the objectives of the mutual security program." One of these objectives is to help bolster the economy of MSA countries by buying more of their goods.

To meet this objective, the Foster memo said, "it is requested that competitive bids from sources in the United States and friendly foreign countries be considered on a common basis."

In the memo there were a number of exceptions which would prohibit award of a contract to any foreign bidder even though his price was lowest. Military officials were told to make sure such an award would not discourage the addition of needed domestic production capacity. Consideration is also to be given to awarding contracts to American small business firms, or depressed industries, or to industries in areas hard hit by unemployment.

Foster Formula . . . It all adds up to this: In the future when a foreign firm is low bidder on a contract amounting to $25,000 or more, the decision of award must be referred to the service secretary for a decision. The secretary is then to apply the Foster formula to the situation in order to make a decision.

Questioned this week, the office of Army Secretary Frank Pace said the Foster memo was "one of many factors that entered into the decision" which resulted in accepting the Ferranti bid.

Fish and Power from the White Nile

Construction of a hydroelectric project by the British on the White Nile in Uganda, East Africa, is no deterrent to local residents who continue to fish in the ancient river's waters. The $42-million project is being constructed at Jinja where the White Nile flows out of Lake Victoria. Known as the Owens Falls project, the installation eventually will have ten generating units with a total capacity of 150,000 kw. A 15,000-kw generator is expected to go on the line in September 1953, three more units by mid-1954.

FINANCIAL

Iowa Utilities Cool to PUC

Private companies say state regulation will make little difference; municipals firmly opposed to commission

Iowa's investor-owned companies told Gov William S. Beardsley's utility study committee that it will make little difference to the companies or their customers if rates and service are placed under regulation of a state utilities commission. Municipal utilities have taken a firm stand in opposition to such a commission. Iowa Rural Electric Co-operative Association has taken no formal action as yet.

Sutherland C. Dows, president of the Iowa Utilities Association and of the Iowa Electric Light & Power Co made the statement recently for the business-managed companies before a nine-member committee which the Governor appointed on Dec. 6, 1951. This committee is studying the advisability of creating a public utilities commission for Iowa. The state has a commerce commission which regulates rail and truck commerce, and with which the utilities file applications for construction of new lines. The commerce commission has no authority over rates, service, or finance of the utilities.

"It will make little difference to the investor-owned utilities or their consumers whether their rates and service are regulated by a statewide authority or by local municipal authorities as at present," Dows said.

No Cure-All . . . He declared that a state commission would not be "a cure-all for the problems which arise under our complex economy, and these problems will be resolved in about the same manner whether a change is made to statewide regulation or not."

"The investor-owned utilities hold that the present system of local utility regulation in Iowa has resulted in the development of well-managed utilities, serving the people of Iowa at rates which are fair and reasonable, and that such service and rates are as favorable as the service and rates of utilities operating in the states which have statewide regulation," he asserted.

The investor-owned companies proposed that if any gas, electric, and heating service suppliers are to be covered by state regulation, all suppliers of the services should be included under the regulatory act, including investor-owned, cooperatively owned, municipally, and governmentally owned.

SUTHERLAND C. DOWS

Municipalities Opposed . . . On the other hand municipal utilities have taken a firm stand against formation of a utilities commission which would have jurisdiction over the municipally operated utilities.

A resolution adopted unanimously at the annual meeting of Iowa Association of Municipal Utilities charged that the creation of such a commission would "add another tentacle" to Iowa's "bureaucratic octopus."

C. G. Hilleary, superintendent of the Villisca, Iowa, municipal plant and president of the association, appeared before the study group with 128 other representatives of Iowa's 87 municipal utilities and made these statements:

"The municipal plant has a successful future, and it can remain a valuable asset to the city if, and only if, the management and the board of trustees can be kept free of any and all political interference.

"To be regulated means the total loss of freedom in management and operation of our plants as we see fit for the best interests of the people."

No Formal Action Yet . . . The Iowa Rural Electric Co-operative Association has taken no formal action on a resolution presented by the manager's section of the association which proposed that the Iowa REA express opposition to formation of a public utilities commission which would have jurisdiction over the REA cooperative operations.

The association's board of directors has scheduled meetings for late August in each of the seven REA districts of Iowa at which the proposal for a public utilities commission will be discussed.

"We will hear the pros and cons of the matter from the directors at these sessions," William H. Wisdom, executive secretary of the board, explained.

An intra-city fight on the question of public utilities control appears in the making at Muscatine where trustees of the municipal plant have opposed inclusion of the municipal plants under the legislation being studied. Mayor Bert P. Olson of Muscatine told the governor's study committee that he and three of the city's aldermen favored the inclusion of municipal plants under the proposed law to create a state utilities commission.

REGULATION

Consolidated Edison Co of New York has received an order from the New York Public Service Commission ruling that nearly all of $25 million reduction in electric rates ordered in 1948 as a temporary measure would now become permanent. Commission said, "With certain adjustments designed to eliminate inequities in the rate structure, which will yield the company additional revenue of about $4 million annually, the freezing of the temporary decrease will continue consumer savings estimated at $20 million annually." Ralph H. Tapscott, chairman of the board, declared "Until we have time to study the findings, we are unable to issue any constructive statement on the effect of this partial restoration of our original permanent rate."

Western Colorado Power Co has received Colorado PUC approval to increase rates by 12.6%.

Today in Utility Finance

YIELDS (%)

Quality	Bonds			Preferred Stocks			Common Stocks		
	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
DATE									
1952									
July 17	**2.96**	**3.00**	**3.11**	**4.09**	**4.29**	**4.62**	**5.39**	**5.84**	**6.35**
July 10	2.96	3.00	3.10	4.07	4.27	4.61	5.42	5.80	6.34
2nd 1952	2.95	3.00	3.09	4.05	4.31	4.60	5.38	5.85	6.42
1st 1952	2.95	2.99	3.13	4.11	4.29	4.66	5.35	6.03	6.47
4th 1951	3.02	3.07	3.21	4.32	4.50	4.91	5.42	6.18	6.84
3rd 1951	2.87	2.91	3.04	4.05	4.27	4.61	5.52	6.24	7.05

Data: Reis & Chandler, Inc.

EARNINGS

	Period Months Ended		Net Income 1952	Net Income 1951	Earnings Per Common Share 1952	Earnings Per Common Share 1951
Arkansas Power & Light	12	June	$5,628,298	$4,348,191	$....	$....
Carolina Power & Light	12	June	6,588,724(a)	6,345,508(a)	....	....
Central Hudson Gas & Electric	12	June	2,159,352	1,553,394	0.85	0.70
Central Illinois Light	12	June	3,002,061	3,199,835	2.78(b)	3.00(b)
Central Maine Power	12	June	4,678,346	4,278,507	1.50	1.34
Central Vermont Public Service	12	June	1,020,073	778,598	....	....
Long Island Lighting	12	June	5,864,357	4,176,035(c)	1.31(c)	1.14(c)
Louisiana Power & Light	12	June	2,729,510	2,591,954	....	....
Minnesota Power & Light	12	June	3,204,869	3,487,935	3.06	3.30
Mississippi Power & Light	12	June	3,268,277	2,862,813	....	....
Ohio Edison, consolidated	12	June	14,747,223	14,386,334	2.74(b)	2.71(b)
Pennsylvania Power	12	June	1,983,605	1,659,075	....	....
Public Service Electric & Gas	6	June	13,121,235	13,979,235	1.26	1.60
Southern Canada Power	9	June	883,380	829,132	....	....
Southern Indiana Gas & Electric	12	June	1,763,482	1,866,391	1.97	2.13
Virginia Electric & Power	12	June	11,254,766	10,131,837	1.80(f)	1.80(f)
Wisconsin Hydro Electric	6	June	110,391	108,903	....	....

Notes: (a) Includes earnings of Tide Water Power Co for periods prior to the date of merger, Feb. 29, 1952; (b) Based on shares at end of each period; (c) Based on 4,199,594.6 shares in 1952 and 3,674,645.6 shares in 1951; (e) Maintenance includes $672,277 for repairs due to extraordinary storm damage, resulting in reduction of net income after income tax of $389,921; and (f) Based on average number of shares.

FINANCING

Company and Description	Amount of Offering ($000)	Offering Price	Yield to Public
WEEK OF JULY 17-23			
Preferred Stock			
Gulf States Utilities—50,000 sh $4.44 $100 par	$5,000	$102.75	4.321%
Common Stock			
General Public Utilities—531,949 sh (being offered common-holders on 1-for-15 basis, record July 1 to expire July 23; additional stock to carry 35¢ dividend payable Aug. 15)	11,171	$21.00	6.67%
WEEK OF JULY 24-30			
Preferred Stock			
Pennsylvania Power & Light—100,000 sh $100 par	10,000 (a)	.....	.....
SCHEDULED FOR AUGUST-SEPTEMBER-OCTOBER			
Bonds			**Bid Date**
Pennsylvania Electric—1st mtg 1982	$9,500	.....	Aug. 5
Seattle, Wash., municipal light and revenue 1970-1987	25,000	.....	Aug. 5
Arkansas Power & Light—1st mtg 1982	15,000	.....	Sept. 9
Carolina Power & Light—1st mtg 1982	20,000	.....	Oct. 20
Preferred Stock			
Pennsylvania Electric—45,000 sh $100 par	$4,500	.....	Aug. 5
Common Stock			
Mountain States Power—200,000 sh	.....	.....	Aug. 11
UNSCHEDULED AND UNDER CONSIDERATION			
Bonds			
Washington Water Power—1st mtg 1982	$25,000	.....	.....
Virginia Electric & Power—1st mtg 1982	20,000	.....	.....
California Oregon Power—1st mtg 1982	7,000	.....	.....
New Orleans Public Service—1st mtg 1982	7,000	.....	.....
Preferred Stock			
Cleveland Electric Illuminating—100,000 sh $100 par	$10,000	.....	.....
Common Stock			
California Electric Power—354,610 sh	.....	.....	.....
California Oregon Power—250,000 sh	.....	.....	.....

Note— (a) First Boston Corp-Drexel & Co group, underwriters.

CALENDAR

***American Institute of Electrical Engineers**
Pacific General Meeting, Hotel Westward Ho, Phoenix, Ariz., Aug. 19-22; Middle Eastern District Meeting, Commodore Perry Hotel, Toledo, Ohio, Oct. 28-30.

Maryland Utilities Association
Cavalier Hotel, Virginia Beach, Va., Sept. 5-6.

Rocky Mountain Electrical League
Fall Convention, Colorado Hotel, Glenwood Springs, Colo., Sept. 7-10.

American Standards Association
National Standardization Conference in conjunction with Centennial of Engineering, Museum of Science-Industry, Chicago, Ill., Sept. 8-10; 34th Annual Meeting, Waldorf-Astoria Hotel, New York, Nov. 19.

American Society of Mechanical Engineers
Fall Meeting, Sheraton Hotel, Chicago, Ill., Sept. 8-11.

Illuminating Engineering Society
National Technical Conference, Edgewater Beach Hotel, Chicago, Ill., Sept. 8-12.

Instrument Society of America
7th National Instrument Conference-Exhibit, Cleveland Auditorium, Cleveland, Ohio, Sept. 8-12.

Edison Electric Institute
Accident Prevention Committee, Sheraton Hotel, Rochester, N. Y., Sept. 15-16; Prime Movers Committee, Roosevelt Hotel, New Orleans, La., Oct. 6-7; AEIC joint meeting, Meter-Service Committees, Mayflower Hotel, Washington, D. C., Oct. 6-8; Electrical Equipment Committee, Roosevelt Hotel, New York, Oct. 13-14; Transmission-Distribution Committee, Hotel Adolphus, Dallas, Tex., Oct. 23-24.

***Pennsylvania Electric Association**
Annual Meeting, William Penn Hotel, Pittsburgh, Pa., Sept. 16-17; Fall Meeting, Meter Committee, Fort Stanwix Hotel, Johnstown, Pa., Oct. 23-24.

Northwest Public Power Association
Accounting Section, Congress Hotel, Portland, Ore., Sept. 18-19.

Public Information Program
Annual Workshop Conference, Edgewater Beach Hotel, Chicago, Ill., Sept. 18-19.

Public Utilities Association of the Virginias
Greenbrier Hotel, White Sulphur Springs, W. Va., Sept. 19-20.

Southeastern Electric Exchange
Fall Meeting, Engineering-Operation Section, Atlanta Biltmore Hotel, Atlanta, Ga., Sept. 25-26; Accounting Conference, Jung Hotel, New Orleans, La., Oct. 16-17; Sales Conference, Thomas Jefferson Hotel, Birmingham, Ala., Oct. 29-31.

National Electronics Conference
8th Annual Conference, Sherman Hotel, Chicago, Ill., Sept. 29-30 and Oct. 1.

Wisconsin Utilities Association
Convention of Technical-Sales Sections, Schroeder Hotel, Milwaukee, Wis., Oct. 1-3.

***Iowa Utilities Association**
Management Conference, Fort Des Moines Hotel, Des Moines, Oct. 6-7.

***Indiana Electric Association**
Annual Convention, French Lick Springs Hotel, French Lick, Ind., Oct. 8-10.

National Farm Electrification Conference
Statler Hotel, Detroit, Mich., Oct. 20-21.

National Electrical Manufacturers Association
Annual Meeting, Haddon Hall Hotel, Atlantic City, N. J., Nov. 10-13.

National Association of Railroad and Utilities Commissioners
Annual Meeting, Hotel Marion, Little Rock, Ark., Nov. 10-13.

* Addition this week.

Channel Cable . . .

. . . between Britain, France reported ready for development work. BEA authorizes funds

LONDON (McGraw Hill World News)—The British Electricity Authority has approved in principle an interim report on the proposed interconnection of the British and French grid systems by means of a cross-channel cable. It has authorized expenditure of $350,000 to begin a development program.

The report was submitted by a joint committee made up of representatives of BEA and Electricite de France. The committee found that there is a prima facie case for the establishment of a cable, a scheme on which two years' investigation has already been carried out (EW, April 14, p 32).

The 25-mile, 132-kv line would ease the peak-load problem in both Britain and France by tying their two grid systems together. Peaks in the two countries are about an hour apart. The interconnection could make it possible to eliminate a 200 Mw station in each, engineers believe.

The committee recommends that preliminary research work should begin to provide technical data for this scheme. It is expected manufacturers will be called into consultation on the required equipment.

Two More Years . . . Development work will probably take about two years, according to an official of BEA. Investigation is to be undertaken into the kind of cable which will be most suitable, the practicability of jointing the underwater cable should it break in the sea, and other problems.

Estimated cost of the scheme is said to be about $12.6-million (£4.5 million). The points between which the cable would run have not yet been decided upon.

In March 1951 Sir Wavell Wakefield, chairman of the Parlimentary Scientific Committee, suggested in the House of Commons that it might be possible to arrange with France for the "export or import" of electricity across the Channel.

Energy Transport . . . He explained that it was becoming cheaper to transmit electricity over long distances than to transmit solid fuel. With direct current at high voltage, long transmission distances and sea crossings were possible, he said.

BEA already has an underwater cable between the mainland and the Isle of Wight.

Changes in Capacity Reported to FPC

PLANT ADDITIONS DURING MAY

State	Utility	Plant	Fuel	Capacity (Kw)
N. H.	Greenville Electric Light Co	Greenville	H	200
Wis.	Fennimore Utilities	Fennimore	IC	700
Neb.	Consumers Public Power District	Scottsbluff	S	7,500
Kan.	Western Light & Telephone Co	Liberal	IC	1,240
Kan.	City of Meade	Meade	IC	900
Ala.	Tennessee Valley Authority	Widow's Creek	S	112,500
La.	Homer Light & Water Plant	Homer	IC	770
Tex.	Vernon Municipal Light Co	Vernon	IC	1,360
Tex.	Gulf States Utilities Co	Neches	S	60,000
Ariz.	Bureau of Reclamation	Hoover Dam	H	82,500
Calif.	Los Angeles Department of Water & Power	Middle Gorge	H	37,500

PLANT RETIREMENTS DURING MAY

Ohio	Cleveland Electric Illuminating Co	Berea	S	4,050
Mich.	Edison Sault Electric Co	Edison	H	4,425
Mich.	Lake Superior District Power Co	Oliver	S	12,000
Kan.	Western Light & Telephone Co	Dodge City	IC	1,240
N. C.	Carolina Power & Light Co	Tidewater	S	5,500
Miss.	Mississippi Power & Light Co	Vicksburg	S	1,250
Ark.	Arkansas Power & Light Co	Marvel	IC	300
La.	Homer Light & Water Plant	Homer	IC	100
Tex.	Vernon Municipal Ligtht Co	Vernon	IC	350
Ariz.	Arizona Public Service Co	Naco	S	500

H—Hydro, IC—Internal Combustion, S—Steam
United States Capacity as of June 1—Hydro, 19,168,342 kw; Internal Combustion 2,004,126 kw; Steam, 55,537,518 kw; Total, 76,709,986

More Aluminum, Less Steel Forecast for 4th Quarter

More aluminum, less steel—that's the way fourth quarter allotments stack up for minor requirements of electric utilities. Copper for this purpose will remain about the same as in the present quarter.

Because of the strike, actual steel allotments for the fourth quarter are the same as advance allotments for that quarter.

For the fourth quarter, electric utilities will be allowed 90% of the aluminum they used in a corresponding quarter of 1950 for minor requirements. This is up 10% over the quota for the present quarter.

But its the same old story on copper. Utilities will be allowed only 50% of the amount they used during the corresponding quarter of 1950, and advance copper allotments for minor requirements are still far short of the actual amounts used in 1950.

There was one ray of hope in Depa's announcement last week. Any utility which finds the quotas insufficient for essential purposes was told to file an appeal.

Con Edison Is Fined $100 for Smoke Law Violations

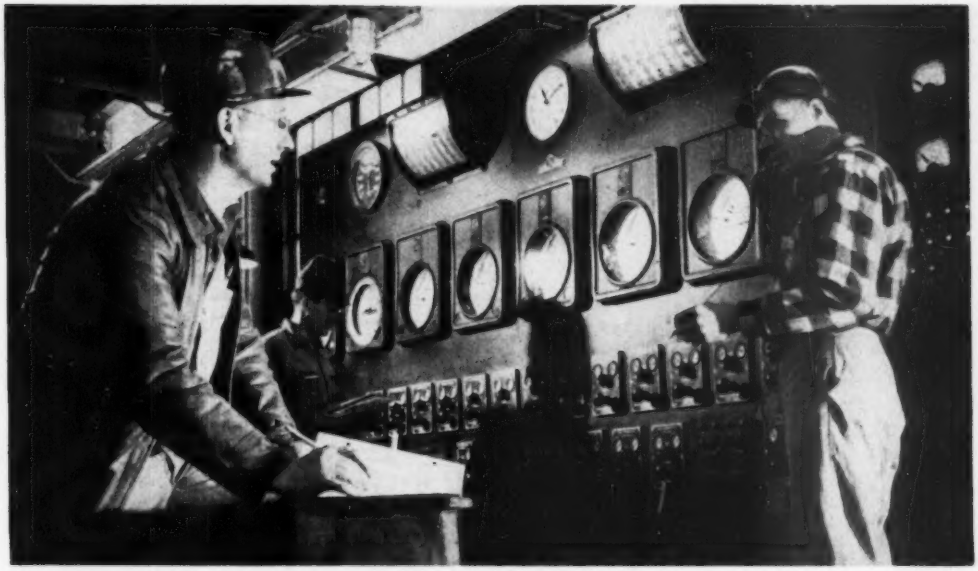
Consolidated Edison Co of New York was found guilty of violating New York City's smoke control regulations and fined $100 on July 17.

The decision against the utility involved smoke emissions from the East River Plant in Manhattan late last summer and fall. Two other cases against the company for smoke violations are pending.

The ruling climaxes a year-long challenge by Consolidated Edison of the power of Magistrates Courts to issue summonses for smoke offenses. In ruling on an appeal from the company earlier this year, the Appellate Division held Magistrates Courts had jurisdiction in smoke cases.

This decision was questioned by the company at hearings held last month involving emissions from the East River Plant (EW, June 16, p 100). The presiding magistrate in delivering his opinion on the case July 17 affirmed the Appellate Division ruling.

The magistrate also held that the smoke control regulations were reasonable and that the city had proved there were unlawful emissions.

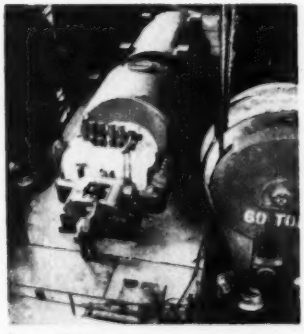


AUTOMATIC CONTROLS regulate operation of boiler using blast furnace gas as fuel. Seven burners provide flexible operation with either blast furnace gas, or fuel oil as fuel. The unit can also be adapted to burn pulverized coal

U. S. Steel Fuels 60,000-Kw Unit With Blast Furnace Gas

New unit at U. S. Steel Co's South Works is largest ever designed for burning blast furnace gas. Unit operates on steam at 850 psi, 900F

W. P. PALMER, Division Superintendent, Power Production, South Works, U. S. Steel Co, Chicago, Ill.



Cover picture

Largest single-shaft unit for industrial plant operation, U. S. Steel's 60,000-kw unit generates at 13,800 volts. It is hydrogen-cooled, connected through underground duct to outdoor transformer

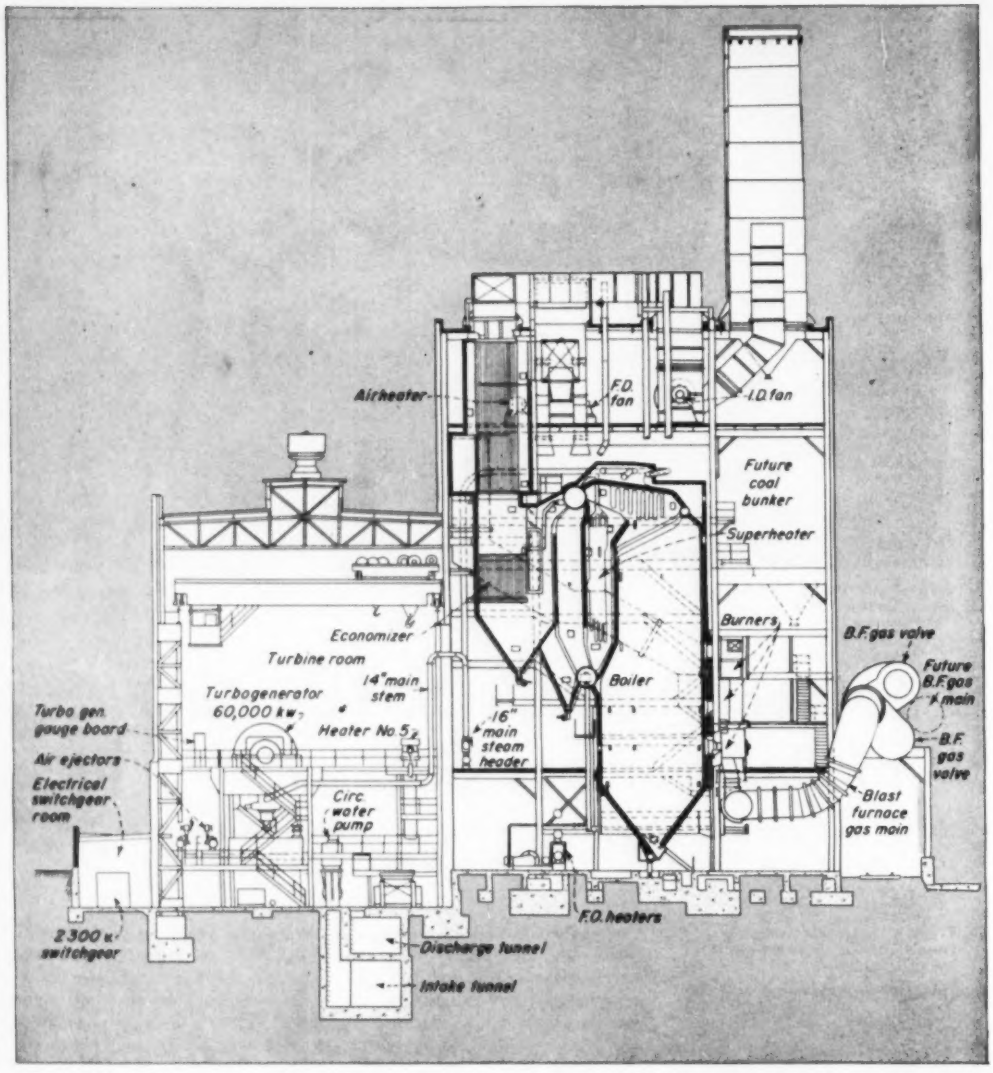
Installation of one of the largest tandem-compound, double-flow, turbo-generators for industrial power production has been completed at the South Works of U. S. Steel Co at South Chicago, Ill. Capacity of the new unit is 60,000 kw at 13,800, 3-phase, 60 cycles.

The turbine, although it is a compound unit, has a rigid coupled shaft and three bearings. The exciter is direct-connected, and the generator is hydrogen-cooled. Unit design was followed with one boiler—one turbine arrangement. The turbine operates at 850 psi, 900 F at the throttle. It has five points of extraction with de-aerating at the 15th stage heater. Steam from the station service water-pump turbine, and the two turbine-driven, boiler-feed pumps operating at 900 psi, exhausts into the de-aerating heater.

Surplus Gas Available . . . Decision to install the new generating unit was based on the need for electric power at the company's nearby Gary, Ind., Works and the availability, under present operating conditions, of an excess of blast furnace gas at South Works. With 10 or 11 blast furnaces in operation there was available sufficient surplus gas to meet 96% of the unit's fuel requirements.

Combination Burners . . . Boiler capacity is 650,000 lb per hour, operating at 900 psi, 900 F at the superheater outlet. This is the largest unit ever installed for blast furnace gas firing. The furnace is completely surrounded by water walls.

The boiler is equipped with seven combination blast-furnace gas, natural gas, and fuel-oil burners and two natural gas and fuel-oil burners.



BOILER with 650,000-lb-per-hour capacity is largest burning blast furnace gas. It supplies steam at 850 psi and 900F to 60,000-kw turbo-generator which is largest single-shaft unit built for industrial plant operation. Generator is hydrogen cooled

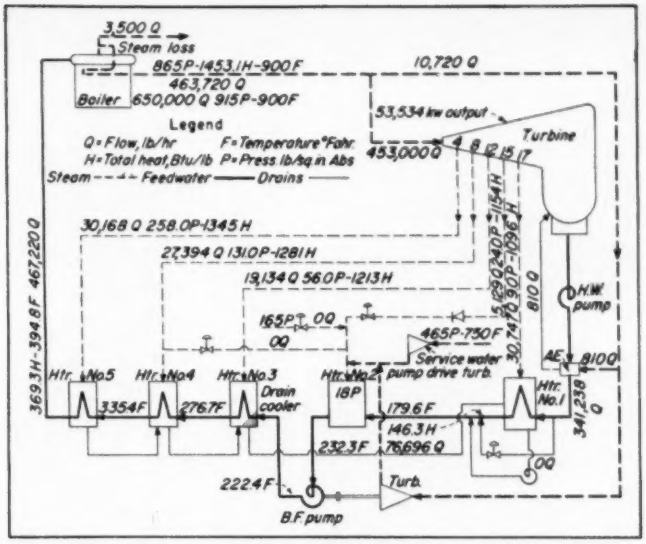
It is designed for pulverized coal firing if and when necessary.

An economizer and a tubular air preheater are used. Superheat is controlled by means of a condenser-type heat exchanger in the lower boiler drum.

Based on past experience with boilers using blast furnace gas with 0.15 to 0.20 gr of flue dust per cu ft, the operating schedule provides for two boiler outages per year, one for general overhaul and insurance inspection and one to clean gas passages. Soot blowers are automatic and push-button controlled. When the control button is pushed, blowing is accomplished sequentially, continuing until blowing is completed, then stopping. Dust is blown three times a day. A steam actuated vacuum system is provided for removal of dust deposited in the setting.

To insure maximum flexibility of the power house, the steam header is cross-connected to the present 450-psi system. For example, in an emergency, this will permit operating the new generator at 50% capacity in case of an outage of the new 900-psi boiler.

Auxiliaries . . . The single-pass, 55,000-sq ft, cross-flow, surface condenser is of the divided water box type. There are two vertical, motor driven 26,000-gpm, circulating water pumps and two motor-driven condensate pumps.



GOOD EFFICIENCY of unit is shown by heat balance diagram for 53,534-kw load

Other auxiliary equipment includes: two centrifugals, barrel-type boiler feed pumps with turbine drives; one spray-type de-aerating feed water heater; four extraction feed water heaters; one motor-driven station service water pump; and one turbine-driven station service water pump.

Make-up for the new unit will be provided from the condensing turbine-driven station service water pump. Operating steam for this turbine is supplied from the 450-psi boilers of the old station.

Regulate Flow to De-Aerator . . . In order to maintain 16-18 psia in the de-aerator at all times, so as to permit it to reduce the oxygen in the boiler feed water below 0.01 cc per liter, steam pressure regulators were: (1) Provided in the seventh stage extraction line to maintain 18 psia in the de-aerator; (2) provided in the by-pass extraction line to the eighth, to open at 17 psia; (3) connected to the 150-lb station steam header to open at 16 psia; and (4) connected in a by-pass in the condensate line around heater No. 1 to open at 19 psia.

A 10,000-gal condensate surge tank, installed on the boiler house roof, and a 10,000-gal storage tank at the de-aerator will overflow to the existing condensate storage tank. A cross-connection on the condensate system is arranged so that condensate can be pumped from the old system to the new as emergency make-up. The hot-well, condensate surge tank, and storage tank are equipped with level controls.

Electrical Features . . . Generation in the older section of the station is at 25 cycles. The new unit 60 cycles, 13,800 v, is connected through an underground duct system to a 77,000-kva transformer in the outdoor substation. There voltage is stepped up to 69,000 v for transmission over two overhead steel tower circuits to the Gary Works of the U. S. Steel Co located in Gary, Ind.

These inter-works transmission lines are controlled by individual pole, reclosing circuit breakers which are interlocked and determine which of the two lines is to be energized for transmission of 60-cycle power. Carrier current relaying and telemetering are provided.

Normal station auxiliary power is supplied by a 5,000/6,250-kva, 13,800/2,300-v step-down transformer, direct-connected to the generator leads. This transformer supplies power to 2,300-v switchgear. The switchgear is divided into two bus sections of six cubicles each. These are connected through a 2,000-amp bus tie air circuit breaker. Each bus section supplies: one 1,500-hp induced draft fan motor, one 300-hp FD fan motor, and one 300-hp circulating water pump motor.

Necessary 440-v motors are supplied by a double-ended, 600-kva, indoor unit substation supplied from the 2,300-v switchgear. The 230-v circuits are supplied by a 25-kva, 460/230-v transformer through a load control center in the station auxiliary switchgear bay.

The generator, station auxiliary breakers, and 69-kv substation are controlled from control and relay switchboards in an extension to the central, 22,000-v substation control house.

All carrier current indoor equipment is mounted in the control house where the load dispatcher's office is located.

Liquid Rheostats . . . Liquid rheostats provide starting service and speed control of the ID fan, 1,500-hp, 2,300-v wound-rotor motors. Moving stationary electrodes in an electrolyte solution vary the external resistance in the secondary windings of the motor and thus controls the speed. A regulating valve in the cooling water line to the heat exchanger maintains proper electrolyte temperature. An interlock between the rheostat and the fan motor starter prevents the circuit breaker from being closed until the electrodes are in the proper position and the electrolyte pump is running. Each rheostat is provided with two electrolyte pumps and with two heat exchangers.

To accommodate the new unit the turbine room was extended 50 ft and the boiler room 75 ft. The building enclosure is of steel sheets which permitted a substantial saving in erection time and cost.

Summary . . . Largest unit of its type for industrial plant operation, the 60,000-kw unit generates at 13,800 volts, three phase, 60 cycle, and is hydrogen cooled.

Automatic controls regulate operation of boiler which is largest that has ever been built for burning blast furnace gas.

Good efficiency of the unit is shown by heat balance diagram for 53,534-kw load.

Seven burners will provide flexible operation with blast furnace gas, natural gas or fuel gas as fuel. Provisions were made for burning pulverized coal in the future, if it proves to be necessary.

PERMANENT TEST TABLE with primary rotating standards concealed in box under controlled temperatures, atop main ac control panel.

Utility Standardizing Lab Designed

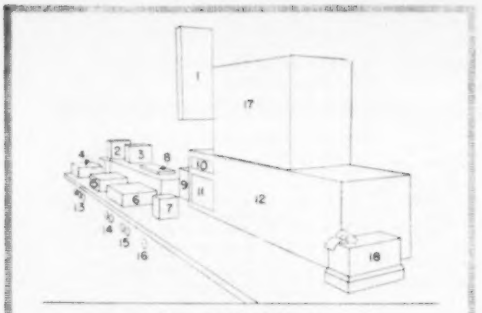
—Repeat Checks Held within 0.1% in Watt-Hour Meter Calibration

Establishment of the true watt-hour within an individual utility and the reliability of repeat checks have long been the laboratory technician's headache. Changes of tenths of percents from day to day and even from hour to hour without apparent reason have added to his concern: Public Service Co of New Hampshire has experienced these "growing pains" and is employing modern techniques to correct them. What were some of these difficulties and how have they been overcome?

Past Causes of Errors . . . Formerly, it is believed, major errors were introduced and probably accumulated, making repeat checks to within 0.4% utterly impossible because of:

1. Disturbing primary wattmeter calibration in moving the meter from storage to checking location.
2. Hit-or-miss temporary wiring connections at time of standardization, including use of obsolete types of reversing switches.
3. Calibration of different coils on the field standards holding loads at different points on the precision wattmeter. We feel quite certain that holding load points below one-half scale on any wattmeter is extremely difficult and does include major errors.
4. The personal error in using a stop watch.
5. Calibrated transfer standard running at various speeds while calibrating the field standard under test.

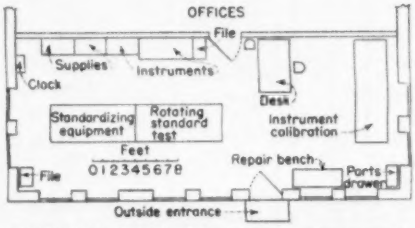
Advantages of New Layout . . . In establishing a new laboratory an endeavor was made to employ the best modern techniques available, fitting these into our system requirements. Physical conditions are such that work can be



Key to Test Table Layout

1. Lab clock
2. Galvanometer
3. Galvanometer
4. Potentiometer
5. Potentiometer
6. Lab wattmeter
7. Rotating std. under test
8. Standard shunt
9. Multi-ratio current trans.
10. AC current switches
11. Photoelectric timer
12. Main ac control panel
13. DC voltage control
14. DC current control
15. AC current control
16. AC voltage control
17. Primary rotating standards
18. Tape chronograph

Standard cells between galvanometers
Lab ammeter and voltmeter back of galvanometers



FLOOR PLAN of standardizing laboratory, where adequate space for staff work and equipment layout eliminate confusion and facilitate uninterrupted routines

for Minimum Errors

FRED AUSTIN, Meter Engineer, and **WARREN CASWELL,** Laboratory Technician, Public Service Co of New Hampshire (Manchester)

done more smoothly, under first-class surroundings and with permanent wiring facilities, liberal space, and quiet. These improvements, in sum, possess the following advantages:

1. Undisturbed calibration of precision wattmeters because they are never moved from checking location.
2. Time saving through leaving instruments in their checking location, permanently wired in, and ready for use at a moment's notice.
3. Employment of a multi-range current and potential transformer set-up makes it necessary to use the precision wattmeter at only two points (600 w and 300 w). These points are well upscale on the wattmeter and so the desired accuracy in checking can be realized.
4. Primary rotating standards used in calibration are also kept running at a constant speed over the various range values of the field standards.
5. A satisfactory timing operation is employed, using a 2-element, tape-type chronograph. This eliminates any personal error.
6. Switch contact trouble is eliminated as changes in connections are made with silver-plated straps.
7. Three standards running in a temperature controlled box have a greater reliability than the former practice of using only one standard for this transfer to field standards.

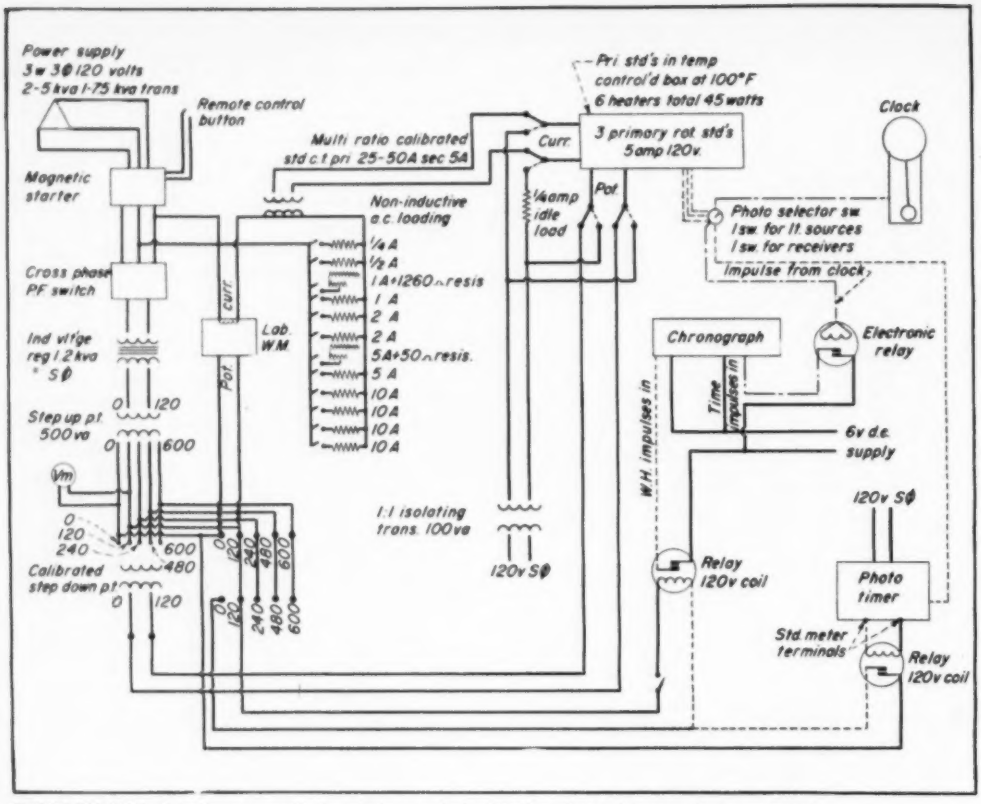
All the above factors have contributed to making it possible to repeat checks well within 0.1%.

Laboratory Features . . . Independent power supply to the laboratory is provided by a 3-phase, 3-wire 120-v, delta-connected transformer bank. Two 5-kva and a 7.5-kva and a 7.5-kva transformer, pole-mounted and with lightning protection, serve this load. A straight resistance load bank is supplied from the larger transformer. This service is run into the laboratory basement through a 100-amp entrance switch and 100-amp magnetic starter. The control button for the starter is incorporated in the main test panel. The basement location of the starter removes from the test panel the noise and vibration necessarily accompanying its operation. The main storage battery for dc voltage and current supply and a 6-kw (50-amp) resistance load bank are located in the basement. Heat from the latter is thus segregated from the measurements laboratory. Control circuits are in conduit, clearing space for free use and noninterference with equipment.

In order to provide mechanical stability for the test work the laboratory floor is covered with battleship linoleum cemented to a concrete floor, carried on steel columns. Vibration is thus minimized. The standardizing room itself is 14 x 36 ft. Special attention was given to the design of the two standardizing tables in order to insure sturdy construction and ample spacing. Each table is 42 x 96 in., is made of 1.25-in. ebony asbestos panel material, and weighs 400 lb. Placed end-to-end, they are supported by a 6-leg base of 1.25-in. iron pipe, welded into a rigid unit. To secure leveling adjustment, each leg is threaded and fitted into a round flange. The lower ends of these legs are welded to sections of 4-in. inverted channel iron provided with blocks of commercial cork extruding about 0.5 in. below the channel and resting on the floor. Table tops are 30 in. above the floor.

Primary Instrument Setup . . . Primary instruments include potentiometers, a volt box, and a multi-range precision current transformer. These are never moved from their places. In one table center is an island section of 0.5-in. ebony asbestos panelling with terminals for current and voltage supply, switches for a galvanometer light beam. On the second table top is attached the main control panel, also of 0.5-in. ebony asbestos, with a control unit 72 x 20 x 18 in. Here are located a photoelectric timer, voltmeter, power-factor switch, and many connection studs, silver-plated for minimum contact resistance.

AC selector switches are of 40-amp rating, toggle-type, running from ¼ to 10 amp (52 amp aggregate), and provided with vernier controls. Impulse selector connection posts are also provided for routing these to the timer. Again, binding posts were used instead of switches of the usual type to minimize contact resistance. AC controls are



WIRING DIAGRAM of equipment assembly for rotating standard calibration, showing interconnection arrangements

by non-inductive adjustable resistors under the table top. A voltage control is also located under the table for more convenient operation.

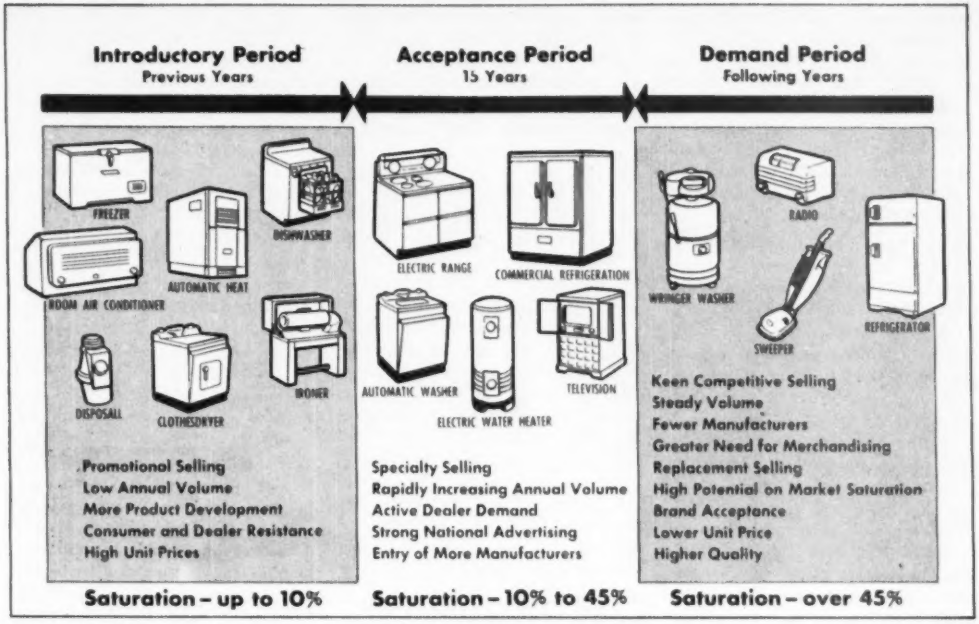
One end panel of this board contains a dc selector switch for both current and voltage. Another panel, located at the other end of the board, is associated with a tape-type chronograph having recording elements for time and for watthour impulses from the selected standard. The wax paper feeding under the two styluses moves at a speed controlled by a governor-regulated motor and is marked by relay movements. The panel enclosure contains a wiring network, dry-type primary, step-up voltage transformer; and a calibrated step-down potential transformer, whose errors are known, used in exact measurement. Other equipment enclosed in this cabinet includes various relays, an isolating transformer to protect the primary rotating standard against lightning surges while in idling load, a loading bank (dc, 10 amps), and a small rectifier for a 6-v dc light source.

Three primary rotating standards are located in an air-conditioned 37 x 25 x 19-in., walnut box, double-walled with 3-in. rock wool insulation between. The inside box is asbestos lined, and temperature is held at 102 F by six thermostatically controlled electric heaters. The three watthour standards have their 5-amp current coils connected in series and their potential coils in parallel. Built into each standard is a light source and receiver tube for transmitting revolution impulses to the outside. These impulses may be sent to one relay of the chronograph for calibrating primary standards or to the photoelectric timer for use in starting and stopping field standards.

When in operation these primary standards are connected with the precision multi-range current and potential transformers so that the speed of the precision standard never changes regardless of the test current and voltage. When not in use they are switched to a special 0.25-amp idling circuit supplied from the lighting service. This is done to keep the discs always turning and the potentials always excited and warm.

Treated thus, the primary rotating standards are found to be extremely stable in performance. A history compiled over many months of regular checks shows this. Intermediate checks between these primary standards and a bench-type standard are made to detect drifts from day to day.

The standard timer is a wall-mounted regulator clock with an 8-day movement. Daily time checks are made by radio from Washington. A light source and receiving tube on the clock case enables the pendulum to cut a beam for time impulses for many uses. Calibration of our wattmeter by dc follows the standard calibrating procedure used in utility laboratories.



UTILITY RESPONSIBILITY for appliance sales ceases when introductory and acceptance periods are ended and customer demand is established

Appliance Dealers Need Leadership

An industry is at stake. Utilities have demonstrated ability to provide appliance sales leadership. Growth will come from developing market for low saturation items

EDWARD R. TAYLOR, Vice President, Hotpoint, Inc, Chicago

Utilities can save the appliance business in the present period of transition from the postwar years of exceptionally favorable sales conditions to the fully competitive economy which we are now entering. In this period, we can expect a high dealer mortality, perhaps as great as 30%, with many of them dumping inventories before going out of business. The unified leadership that should rightly be assumed by the leading appliance manufacturers has been lacking. Today, the utility industry is one of the most stable factors in this confusing picture.

Shakedown Period . . . We must realize that the transition or shakedown period has arrived in the appliance industry, and in many other businesses concerned with manufacturing and marketing consumer durable goods. In my opinion, this is not a slump. It is simply a return to the historical pattern of business in which there is a plentiful supply of merchandise, and in which the retailer must seek out the consumer, create a need for his product, and close the sale. In recent years, specifically in 1949, and again in 1951, retail sales took a nosedive as appliances came into free supply. Each time, hasty expedients saved many retailers — and manufacturers — who were on the ropes. Now, with the Korean scare buying behind us, and with prospects of plentiful merchandise for the foreseeable future, we can no longer look to such shots in the arm to pep us up.

Dealer ranks in the appliance industry became overpopulated in the postwar period, a logical development resulting from the tremendous build-up of demand following the unproductive war years. Literally thousands of inexperienced retailers flocked into the business seeking a kill in a lush market. As we all know, many retailers set up business on a shoestring, ordered any and all kinds of available merchandise and customers took it away from them.

There Were Salesmen Once . . . Before the war, there were approximately 60,000 appliance dealers in business. Competition was tough; they had to do real selling to survive, and adequate servicing facilities were considered a necessary part of their operations. Today, we estimate that there are about 100,000 dealers handling appliances, with a sizeable number not equipped to service the goods they sell. Assuming that there will be a shrinkage of around 30% in the next few years, we would settle down to a streamlined retail selling structure of approximately 70,000 outlets.

This raises the question of the ratio of dealers to expanded production ca-

pacity. The appliance industry has expanded about 300% over pre-war, in terms of factory output potential. At first glance, it might seem logical that it would require a much larger number of retailers to market this output. However, today we find much greater specialization in appliance selling. There is an unmistakable trend to large-volume dealers and those handling full lines of merchandise.

Projection on Wrong Bases . . . Another factor to consider in an analysis of present business conditions is the system of forecasting demand that was popular in the industry immediately following the war. At a time when there was an enormous unfilled demand for all types of home equipment, it was simple to project figures of potential demand, in terms of millions of units, well into the future. There was little relationship between projected production and actual volume the market could absorb. For example, a realistic outlook would not justify a prediction that the market could indefinitely absorb astronomical outputs of refrigerators such as the more than 6 million units sold in 1950. Yet it was in new facilities to make refrigerators, an already high saturation item, that the bulk of post-war expansion took place.

Many businesses are now in the process of liquidating surplus inventories. The appliance industry is in an inventory recession on refrigerators. If we stop to examine the market and productive capacities, this is not difficult to understand. Our expanded factories have a capacity to produce 7 million units. There is a factory and field inventory of some 2 million units, giving a total of 9 million refrigerators to be absorbed in one year. But the market can absorb less than 4 million units, indicating there is pressure at retail to move these appliances.

Calls for Creative Selling . . . This situation, coupled with the general apathy among retailers to a revival of aggressive, creative selling has brought a wave of price-cutting that could undermine the standard of values throughout the industry. While the business has changed dramatically from one in which refrigerators accounted for 67% of the volume (1941), to one in which refrigerators make up only 37% (1951), few retailers are putting the proper emphasis on the new low saturation items from which future profits must come.

It is true that there is a certain amount of price resistance among buyers. This applies to all industries making consumer durable goods as well as to the appliance industry. However, many retailers, in attempts to stimulate buying, have substituted price-cutting for creative selling. Actually this price resistance is fanned by price-cutting.

There have been several instances in the postwar period that bear this out. For example, the price-cutting wave that swept through the appliance business in the spring of 1949 did not stimulate buying; actually it had just the opposite effect. Consumers took the attitude that they would sit it out and see if prices went lower. It was not until the general public became convinced that appliance values represented a sound investment that they resumed buying, and the price structure again became stabilized.

Selling Is Imperative . . . The surplus capacity in the appliance industry dramatically focusses attention on the need for selling to close the gap between consumption and output. Obviously, an economy that is expanding to the point where it will be able to produce civilian goods at 1950 levels and still maintain the largest military machine in our peacetime history could suffer a severe set-back unless the market is developed to absorb increasing output.

In my opinion, the only way toward enlargement of the appliance market is to pioneer the low saturation items that now constitute two-thirds of the volume. It should be noted that most of the low saturation appliances are high in energy consumption, either directly as in the case of clothes dryers, or indirectly, through greater use of hot water as in the automatic dishwasher. Promotion of their use ideally serves the purpose of building residential revenue per kilowatt of capacity and per customer served, particularly during off-peak periods. These characteristics are important at a time when management faces the problem of absorbing increased operating costs and higher fixed charges on greater investments.

In the pre-war period, it was the utility industry that pioneered the electric range and the electric water heater, not only increasing residential revenue, but also paving the way for electrical living as we know it today. Electric companies can again take the leadership in pioneering the new post-war products, to furnish a stabilizing influence at the retailers' level.

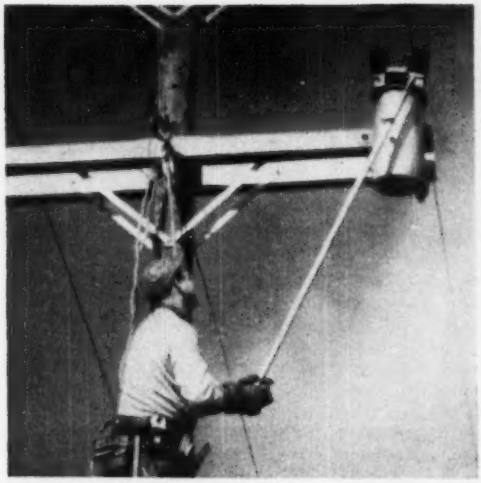
It is interesting to note that the present ratio of utilities that are merchandising is more than two to one. In our experience we have found a correlation between sales by dealers and utilities.

Not Dealers Only . . . It is perhaps an oversimplification of the conditions prevailing today for a manufacturer to dwell on the lack of selling effort on the part of dealers. Actually, there has been an appalling lack of leadership among the major appliance producers. This leadership, to which dealers are looking, is desperately needed today in the pioneering of appliances and other electric home equipment which have not yet reached wide acceptance. Utilities can furnish this leadership; and every major manufacturer should join in accepting the responsibility growing out of the nation's tremendous new production capacity, both in finished goods and basic materials.

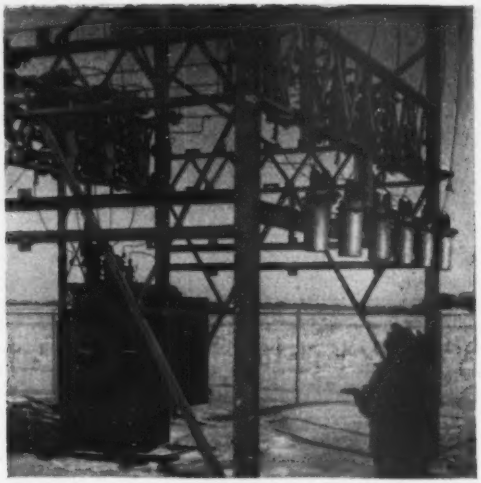
Utilities Must Pioneer . . . The electric utility industry, with a greatly expanded capacity of its own, has an important stake in such a program. The history of the appliance industry shows that retailers have neither the facilities nor the long-range foresight to do the necessary pioneering job alone. As retailer ranks thin out, dealers will become more conscious of the assistance electric companies can render in promotional selling programs.

The retailer must be educated to a clear realization that there are two definite sides to the appliance picture today. He must know both of these sides, and place the proper emphasis on each. On one side are the "demand" items which have reached high saturation, and constitute largely a replacement market in the future.

On the other side of the picture are the "growth" items requiring specialty selling. They cannot be sold on the basis of price or bargain appeal. Customers must be educated to the need for them. Pioneering the new products will take unified effort that should start at the management level of the electrical industry, spearheaded by electric utility companies and appliance manufacturers.



SINGLE-POLE RECLOSERS installed on crossarm. Lineman must climb pole when maintenance is required or when recloser locks out



SUBSTATION INSTALLATION of reclosers for distribution line protection. Failure of even one unit would cause large loss of load

Maintenance of Reclosers And Sectionalizers Pays Off

A well planned servicing program for reclosers and sectionalizers not only reduces maintenance costs but cuts repair costs, builds revenues and customer good will lost from outages, and increases safety to operating personnel.

D. C. ALLRED, C. & A. Engineer, District Engineering & Service Dept, Westinghouse Electric Corp, East Pittsburgh, Pa.

Failure of a recloser or sectionalizer is expensive not only in the cost of the device but also in the cost of making repairs to the system. Often the service interruptions occur at times when higher wages must be paid to repair crews. Revenues and customer good will, often of considerable amounts, also are lost. Failure of a recloser at a main substation may disconnect a large percentage of the system load. For many reasons, therefore, a workable maintenance program should be adopted by all power distributing groups with sectionalizing equipment.

A large number of REA cooperatives, privately owned power companies, and municipalities in the southern part of the United States were recently visited. The actual service practices for reclosers and sectionalizers were discussed with superintendents, repairmen, maintenance supervisors, and other associated personnel. This area is subject to a high frequency of lightning strokes and thus serves as a good proving ground. Maintenance practices here are probably indicative of what is being done throughout the country.

Of the 98 power distributing groups contacted, 68 had a significant number (six or more) of reclosers or sectionalizers in use. Approximately 63% of this number said they had no maintenance or service program whatever. Another 15% admitted that their schedules were not followed closely at all. Although some sort of program had been set up, equipment checks were more or less haphazard. Such replies indicate that 78% of the users are paying very little attention to the operating condition of their reclosers and sectionalizers.

Maintenance Needed . . . By nature of its construction and operating requirements, the recloser is not a device which can give satisfactory service indefinitely without attention. It depends on the insulating property and cooling effect of the oil for proper operation. Even the interrupting ability is dependent on the oil for extinguishing the arc. The useful life of the recloser when it is given no maintenance becomes merely the life of the oil and contacts.

There are three main causes of oil failures. One of them is the formation of carbon in the oil when the contacts are opened to interrupt the circuit. The particles of carbon reduce the insulation strength.

Figure 1 gives some indication of how serious the effect of carbon in the oil can be. This curve gives the approximate test value of oil in a typical recloser operating on a 15-kv line. Each operation is an interruption of a 1,200-amp current with the

Number of Operations at Various Interrupting Percentages

Amperes in Percent of Interrupting Rating	Unit Operations of 50-Amp Frame Recloser	Unit Operations of 100-Amp Frame Recloser
15-20%	40	40
45-55%	40	20
90-100%	20	12
	100	72

full 15 kv across the bushings. Beginning with new oil in the tank, the insulation strength drops from about 30 kv (standard test cup) at 0 operations to approximately 10 kv after 34 operations. It was assumed for this curve that none of the carbon would settle out between operations and that the interruption of the current would require two cycles.

A second deteriorating force is the presence of moisture in the oil. The gases which are produced when the recloser operates must have some place to escape from the tank. A vent hole is provided in the cover for this purpose. Herein, however, lies the source of our second cause of trouble. With this opening in the tank the recloser inhales and exhales air as the temperature changes with variation in load. During this breathing process part of the moisture contained in the air will condense inside the tank and gradually contaminate the oil.

The presence of moisture is quite variable in its effect. Water which settles to the bottom of the tank may not cause any particular trouble. However, if it diffuses throughout the oil in small droplets, it can seriously reduce the insulation strength. Different size droplets produce different reductions in dielectric strength. Therefore, there is no means of predicting exactly how much effect moisture in the tank will have.

Most of the water will probably be absorbed by the pressboard tank liner. Unless the liner swells and moves out near a live part of the mechanism, there will be no serious consequences. All liners which show that they have absorbed moisture should be changed when the unit is serviced.

Oxidation of the oil, the third deteriorating agent, is usually much less important than the other two factors. Oxidation does become serious if the equipment is used for years without an oil change.

Results of Poor Maintenance . . . The above factors produce a gradual decrease in the dielectric strength of the oil. Finally, a condition is reached where the recloser will not withstand the normal 60-cycle voltage stresses.

Even before this condition comes about, however, the coordination between bushing and internal flashover values is lost. High voltage stresses on the line at this time may cause an internal flashover instead of a nondestructive bushing flashover. Disturbances on the line which cause high voltage stresses occur when closing in on a shorted line, when picking up a locked-out line, while clearing temporary faults, or during lightning storms.

Should an internal flashover develop during one of these surges, the heavy arc inside the recloser or sectionalizer tank produces high pressures with a possible explosion and burning of the equipment. The same situation can come about if the recloser is unsuccessful in clearing a fault. Failure to interrupt the fault current results, of course, from oil in such poor condition that it will not put out the arc between the contacts.

Fortunately, such failures have not been common in the past. An estimated 50,000 reclosers have been applied in the past five years, and thousands of additional units are being placed in service annually. As operating time continues to accumulate on the equipment without any maintenance being given, the incidence of failure which is due to neglect of maintenance indicates definitely that a service program should be adopted. A point to be emphasized is that injury to operating personnel can result. Instances have shown this.

Associated equipment also can be jeopardized if fire results. Chief danger to individuals occurs when they are near the apparatus at the time of failure. It is entirely possible for a

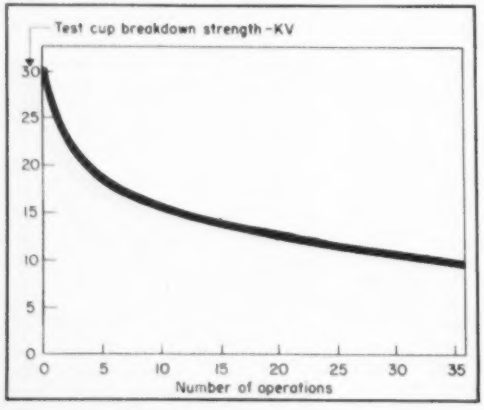


FIG 1—POSSIBLE EXTREME RATE of oil deterioration in 50-amp recloser. Interruptions are at full power (15 kv and 1200 amp). Assumption is that none of carbon settles out of oil between operations

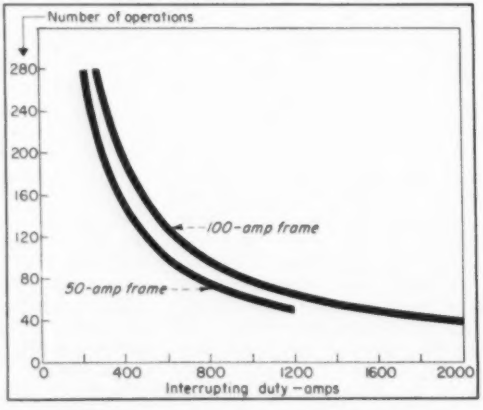


FIG 2—SUGGESTED NUMBER of operations for reclosers before an oil change and inspection are made. Expected interrupting duty should be taken from system study made when equipment is applied

INSPECTION and maintenance can be done in minutes. Yearly servicing reduces all failures caused by moisture and acids in the tank

FIELD SERVICE is a very simple operation. Oil is changed, parts inspected and cleaned, contacts filed—and unit is ready for use

lineman to be on the pole near a recloser or sectionalizer at the time high voltage surges appear on the line. In fact, his operation of the equipment may cause such surges.

At present a large percentage of the reclosers and sectionalizers in use are installed on lines of REA cooperatives. During the short period from July 1950 to March 1951, three injuries to personnel while associated with reclosers were reported.

Maintenance Programs . . . Practically all manufacturers recommend that the oil in a 50-amp frame recloser be changed and that the mechanism be inspected every 100 operations or once every year whichever comes sooner. For the sectionalizer, the recommendation is for an oil change every 200 operations or every two years whichever comes sooner.

Admittedly, such care may be on the conservative side. However, for general instructions which have to include all types of applications these recommendations are very reasonable. The oil change and inspection on the basis of a certain number of operations is designed to prevent failures caused by carbon in the oil. The yearly basis for service is recommended to reduce failures caused by moisture and acids in the tank.

Standard operating duties have been adopted by the NEMA. For the 50-amp frame a total of 100 operations is selected as the basis for an oil change and inspection. The duty assumes that all of the operations are not going to be at 100% of the interrupting ability, however. The accompanying table gives the number of operations at various interrupting percentages for both the 50- and the 100-amp frame. Note that the total for the larger 100-amp frame is only 72.

Discussions with utility personnel who have had experience with recloser maintenance reveal that the manufacturers' recommendations are considered too conservative. In the majority of instances when a recloser was serviced at the recommended interval, it was found to be in excellent condition, without need of service. In a few cases, however, reclosers were found which should have been serviced previous to the indicated time.

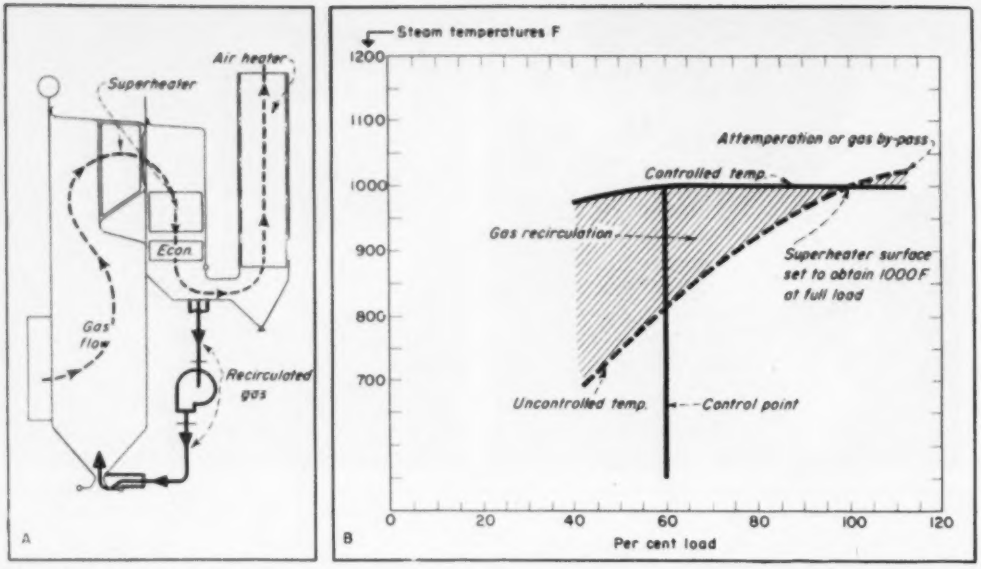
Each utility has a different problem in recloser and sectionalizer maintenance and should, therefore, set up its own service program. As the interrupting duty and frequency of operation of each recloser are likely to be different, such a program should take into account these facts. From the system short circuit study which is made when the apparatus is applied, one can determine approximately what fault currents are going to be interrupted by each recloser.

To make this service plan workable a card file giving information on each recloser and sectionalizer should be kept. A card record form for this purpose was proposed by the REA Technical Standards Division, and similar forms are now being supplied by several manufacturers. Counter readings should be taken every three months for units near substations or where the interrupting duty will be high. For equipment farther out on the lines a reading every six months or year would probably be sufficient. In areas where lightning storms might cause excessive operations the length of time between counter readings should be shortened.

Knowing the approximate interrupting duty of each recloser, the maintenance man can tell from Fig 2 how many operations it can go through before it needs an inspection and oil change. The curve for the 50-amp frame applies to all ratings of that frame—5, 10, 15, 25, 35, or 50 amp. Likewise, the curve for the 100-amp frame applies to all ratings of its frame size—25, 35, 50, 70, or 100 amp. As an example of the use of these curves, suppose we take a 50-amp frame recloser which is applied where its interrupting duty is approximately 600 amp. The lower curve indicates that the oil should be changed after 100 operations.

An alternate system which has been used to good advantage involves taking spot checks. Instead of keeping a record of counter operations to determine when the apparatus should

(*Continued on page* 149)



CONTROL OF STEAM TEMPERATURE can be achieved by recirculation of combustion gases: (a) Application to the case of a horizontally-fired boiler. (b) Gas recirculation at partial loads, and gas bypass (or attemperation) to control steam temperature above

Recirculated Gas Holds Steam

More designers are returning combustion gases to boiler furnaces to supplement or supplant usual methods of controlling steam temperature and conserve superheater materials

Practically all utility boilers are provided with means for maintaining a constant steam temperature over a considerable load range. Various methods have been developed. One of the newest is an improved method of using recirculated flue gas.

Control, Non-Reheat Boilers . . . In non-reheat boilers one of the most popular designs of superheat control is that in which sufficient superheater surface is installed to obtain the required steam temperature at the control point—usually 50 to 70% of full load. Then as load increases, the steam temperature is maintained constant by means of attemperators of the spray, submerged surface, or condenser type.

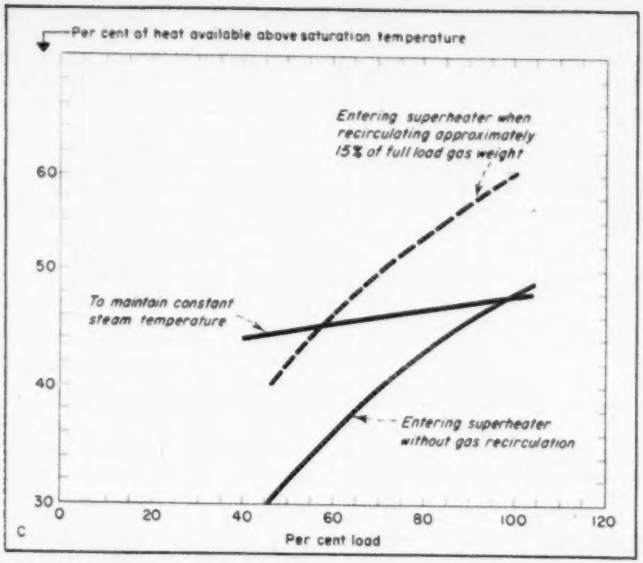
Attemperation control by this method is relatively simple and, because of this, attractive. However, it does involve the use of excess superheater surface at loads above the control point. Therefore, it is imperative that full advantage of gas temperature and surface location be taken to minimize the surface requirements.

- Another means of controlling superheated steam temperature utilizes gas bypasses and dampers.
- Steam temperature can be controlled also by utilizing multiple furnaces.
- Steam temperatures are affected by burner proximity and furnace effectiveness, therefore, they can be controlled by spacing burners and/or changing the direction of burner flame propagation by burner positioning.

Recirculation of Gas . . . Steam temperature can also be controlled by gas recirculation—a method predicted upon certain fundamental laws of heat transfer. In this method of control a portion of the products of combustion taken from a relatively cool temperature zone—usually the boiler or economizer gas outlet—is recirculated back into the furnace. The gas is introduced into the furnace at a location to avoid interference with the combustion process. This gas provides a means of modifying the absorption of heat by the furnace walls thus controlling the quantity of heat in the gases leaving the furnace and, consequently, the heat available for superheating steam.

The effectiveness of the furnace heat-absorbing surface is modified through a blanketing effect which is dependent upon the amount of gas recirculated and the location and manner of reinjection. With gas recirculation there is also a greater quantity of gas passing over the convection heat-absorbing surfaces and thus heat transfer rates are increased.

When gas recirculation is used, the superheater surfaces can be established to meet the full load temperature requirement; and steam temperatures can be maintained at partial loads by varying the amount of recirculated gas. The recirculated gas increases resistance to gas flow across the boiler unit; but if it is used only at loads below full rating, no allowance for its



full load. (c) Percentage of heat available for superheat absorption depends on amount of gas recirculated through the reheat stages

Temperature Efficiently

GEORGE W. KESSLER,* Assistant Manager
Proposition Division, Babcock & Wilcox Co

use is necessary in the establishment of forced and induced draft fan sizes.

Control, Reheat Boilers . . . Although any of the methods mentioned can be used to control the steam temperatures of non-reheat boilers, the addition of reheat presents another variable. Many reheat units are designed not only for constant superheat but also for constant reheat temperatures over a good portion of the load range in order to obtain high cycle efficiency at partial loads. Thus, both superheat and reheat temperatures must be controlled simultaneously.

This simultaneous control can be effected by using attemperators for both the superheater and the reheater. With this method it is necessary to provide sufficient surface to obtain both the required steam and reheat temperatures at the control point, and remove heat by attemperation at the higher loads. Because of the large amount of heat which must be removed by the attemperators at top load, they are usually of the spray type.

This method of control is limited in load range when high superheat and reheat temperatures are used, since it is not unusual in high temperature installations for the superheater and reheater to absorb 45 to 50% of the total heat absorbed in the unit. Therefore, to obtain the required superheat and reheat absorption at the control point, without installing an inordinate amount of surface, fairly high furnace gas temperatures may be required. If this is the case, the furnace exit gas temperatures may be excessive at the top load; and with this method of control they can be decreased only by the adoption of a smaller control range.

Twin furnace units also can be provided with both superheaters and reheaters. However, if only two furnaces are available to control three factors—capacity, steam temperature, and reheat temperature—by variable firing, another means must be used to supplement the control. This auxiliary control is usually accomplished by attemperators.

Combination Desirable . . . Although gas recirculation or burner positioning will provide a good control range, neither method can be used alone to control simultaneously both steam and reheat temperatures. This results from the fact that the heat absorbed per pound of superheated steam is practically constant over the control range, but the heat absorbed per pound of reheated steam increases as reheat temperature is held constant with decreasing load. Therefore, if gas recirculation or burner positioning is used to maintain reheat temperature, the superheat temperature will rise above the prescribed limit as load is decreased. Conversely, if either of these methods is used to control superheat temperature, the reheat temperature will be found to decrease with a decrease in load.

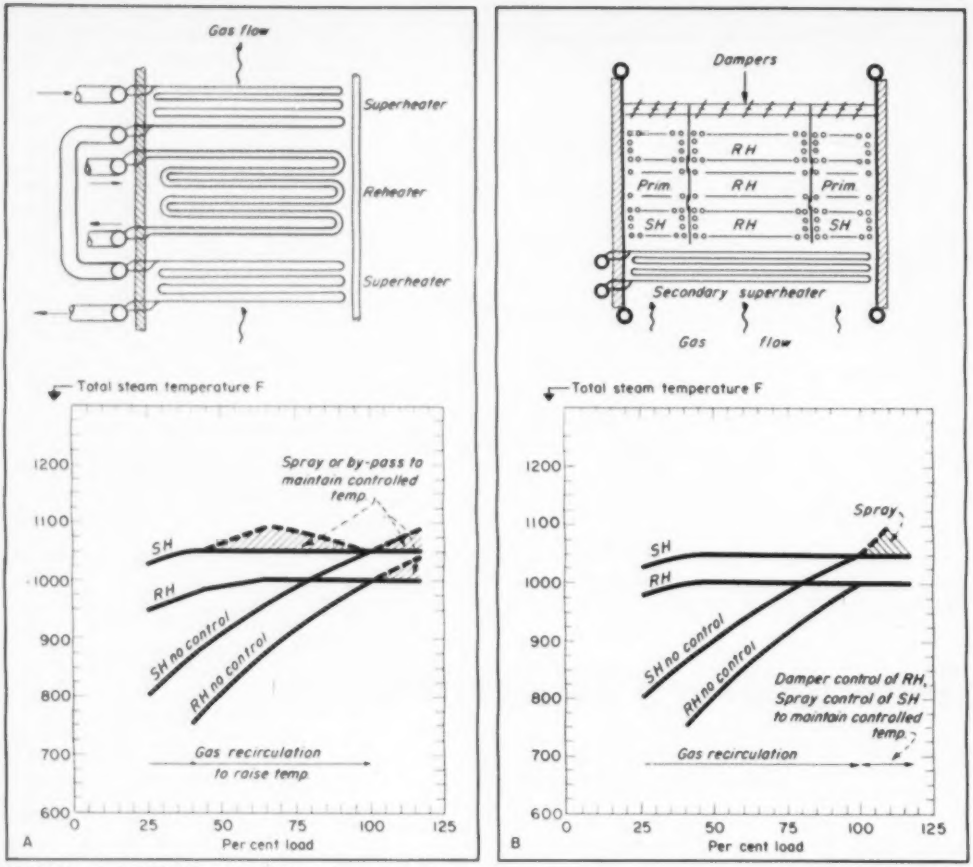
The solution has been to combine different methods of control while retaining the best features of each. This has been accomplished by using attemperators or gas bypass to reduce the superheat temperature while using gas recirculation or burner positioning to raise the reheat temperature at the reduced loads. With these combinations of control, gas recirculation or burner positioning is used to control the reheat temperature over the load range, and the reheater surface can be sized to obtain the desired temperature at full load.

The superheater surface also can be established to provide the required superheat temperature at full load—and the maximum attemperation, or gas bypass, is at some partial load. Thus, these controls are the reverse of attemperator and bypass controls on non-reheat units.

Present Trends of Control . . . Although there are many ways in which both superheat and reheat may be controlled over a wide range, the present trend as indicated by units recently placed into service, units building, and design proposals is toward the use of gas recirculation or burner positioning in conjunction with spray attemperators or gas bypass.

There are several reasons for this well defined trend. With either gas recirculation or burner positioning both superheater and reheater surface re-

* Adapted from recent ASME paper entitled "Some Trends and Considerations in the Design of Modern High Pressure High Temperature Boilers."



CONTROL OF SUPERHEAT AND REHEAT temperatures utilizes series or parallel gas flow. (a) Series—Gas recirculation to raise temperatures, and spray attemperation or gas bypass for auxiliary control. (b) Parallel—Recirculation with gas proportioning dampers

quirements are reduced because they can be sized to obtain the required temperatures at the top load. Further, with either of these two methods the gas temperature leaving the furnace at full load usually is much lower than that required when attemperators only are provided to cover the same control range.

These methods also allow greater latitude in the disposition of heating surfaces as well as the adjustment of surfaces with respect to selected optimum exit gas temperatures. This is not always possible with some of the other methods of control unless restricted control range is acceptable.

Economically both gas recirculation and burner positioning have much to offer. Because surface requirements are minimized, the overall cost, steam pressure drop, draft loss, and the space occupied are reduced. When these methods are used in conjunction with attemperation, the maximum attemperation occurs at some partial load in the control range and, if surfaces are properly disposed, only in the superheater. This in general reduces alloy requirements and is consequently reflected in the cost of the unit.

Series and Parallel Flow . . . When using gas recirculation or burner positioning with attemperators for the control of reheat boiler units, the so-called "series arrangement" of surfaces can be used. In these designs the reheater is located between the primary and secondary superheaters, and the products of combustion from the furnace pass across the secondary superheater, the reheater, and then the primary superheater in their path toward the boiler exit.

This arrangement can be designed so that it should not be necessary to use attemperation in the reheater at any load. However, because it is not always possible in any design arrangement to establish the exact superheater and reheater surfaces and because of variations in fuel and the effectiveness of furnace heat absorbing surfaces, attemperators often are installed at the inlet to the reheater. Then, if the reheater absorbs too much heat, the required exit steam temperature can be maintained by spraying the steam prior to the reheater inlet.

There are some who place considerable emphasis on minimizing the quantities of spray water used in both superheaters and reheaters. Conse-

quently, many of the recent reheat boiler designs using gas recirculation incorporate a "parallel flow" arrangement which combines the best features of gas recirculation and spray attemperation, along with gas proportioning.

In this arrangement it is customary for the products of combustion, after leaving the furnace, to pass across the secondary superheater. The gas is then divided into parallel flow streams which pass across the reheater and the primary superheater. The primary superheater and the reheater are separated by division walls, and the dampers located at the outlets of the respective passes establish the proportions of the gas flows.

The gas proportioning dampers may be used for temperature control or for readjustment. When they are used for control, the percentage of gas flowing across the superheater can be reduced as load is decreased. This provides the required greater proportion of heat to the reheater. By properly correlating gas recirculation with damper proportioning of gas flow it is possible to obtain the required superheat and reheat temperatures over the control range without attemperation and with a reduction in the quantity of gas recirculated as compared to that required with the series arrangement.

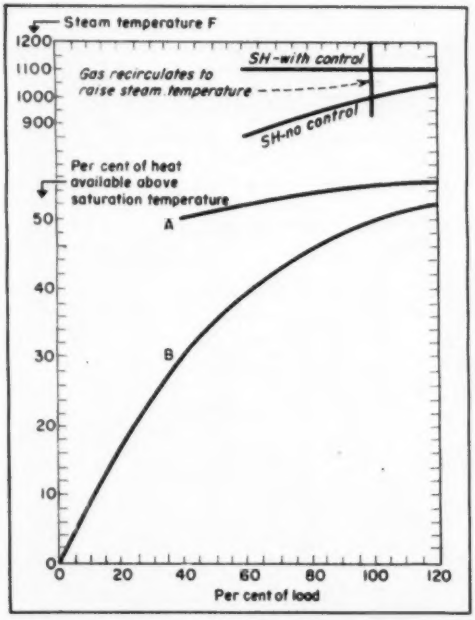
Advantages as Temperatures Increase . . . In high temperature installations the many advantages of gas recirculation become more pronounced because it also is possible to recirculate gas at full load. When this method is used, it has the effect of sizing the superheater and reheater at some load in excess of full load. Consequently the furnace exit gas temperature at full load can be maintained at a lower level.

Also, in another design variation it is possible by installing a slightly greater amount of superheater and reheater surface and by properly selecting the zone of gas injection to retain the heat potential corresponding to high furnace temperature and yet restrict the gas temperature leaving the furnace to a value consistent with satisfactory operation.

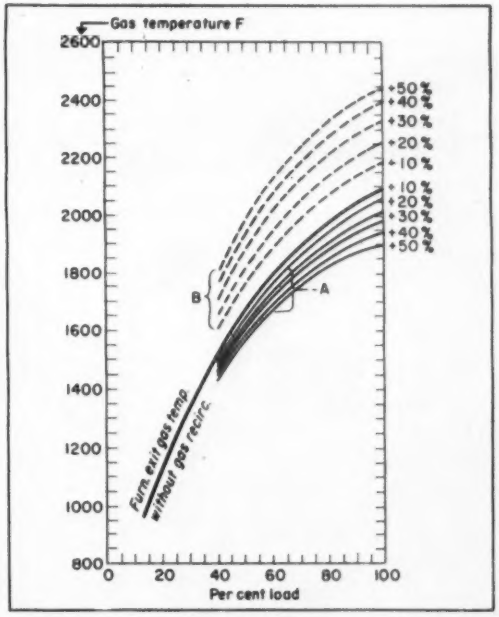
Stage Reheating with Gas Recirculation . . . This practice of gas recirculation may soon come into prominence if fuel costs continue to increase and superheat and reheat temperatures are limited by available materials, requiring improved plant efficiency without increasing steam temperatures. A study of Rankine cycle efficiencies shows that this could be accomplished by increasing the number of reheat stages.

However, with two or three stage reheating the heat absorption in the superheaters and reheaters will be more than 50% of the total heat absorbed in the boiler unit. Thus, since the temperatures of the products of combustion leaving the superheater and/or reheater are usually 75 F or more above the steam temperatures in these zones, furnace exit gas temperatures must be increased to provide the necessary heat potential to the superheater and reheater, unless some means such as gas recirculation provides the same heat in more gas at a lower temperature.

This design variant of gas recirculation can be used to advantage when the quality of the fuel and its slagging characteristics impose limitations on furnace exit gas temperatures.



FULL-LOAD STEAM TEMPERATURE CONTROL by gas recirculation (2050 psi 1100/1050F). Curve A: Percent heat available entering superheater required to maintain constant steam temperature. Curve B: Percent heat available entering superheater without gas recirculation and subsequent reheating



VARIATIONS IN FURNACE EXIT GAS TEMPERATURES for equivalent heating effects. Group A: Calculated gas temperatures leaving furnace for indicated percentages of gas recirculation. Group B: Gas temperatures leaving furnace with normal gas weight to obtain equivalent performance for indicated percentages of gas recirculation

Food Service Equipment in Ohio School

Extensive installation of commercial food service equipment in cafeteria and of major domestic appliances in home economics department impresses school authorities

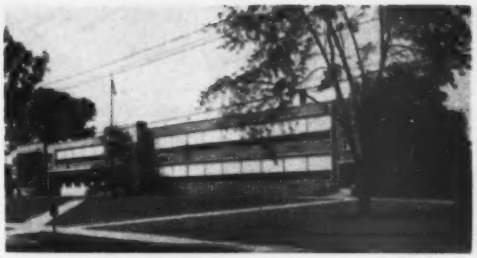
CONFERENCE ATTRACTED 363 educators and others concerned

ELECTRICAL EQUIPMENT was the feature of the inspection tour

GOOD LIGHTING and efficient arrangement create pleasant working conditions around bake oven and heavy-duty ranges in the cafeteria

Sets Electrical Pace

R. W. BUTTS, Commercial Sales Supervisor,
Ohio Edison Co, Akron, Ohio



Modern food preparation and service got a big boost in Ohio recently when a conference on planning home economics classrooms and school cafeterias was held in the new Harry B. Turner Junior High School in Warren.

The conference was arranged by the Warren school authorities with the help of the Ohio Edison Co. It was attended by 363 educators and school administrators, architects, and consulting engineers. On an earlier occasion, when the school was formally opened, over 1,700 local citizens inspected the electric facilities for teaching and food service.

Most Modern in Ohio . . . Resulting from the sales efforts of C. E. Sperow, Ohio Edison commercial cooking expert, and Walter Schultz, local representative in Warren, an installation of over 175 kw in electrical equipment, exclusive of lighting and building services, has been made in the new school. Details of the installation are listed in the adjacent panel. Included in the selling job were suggested plans for the cafeteria and classrooms, complete with specifications for, and placement layouts of, equipment, together with provision of wiring adequate for it. The plans were accepted by the school authorities and the architect. Now, Warren points to its new junior high as the most modern in the state.

School Officials Invited . . . From this feeling of pride in the new school came the idea of the conference. Paul A. Miller, superintendent of Warren schools, sent a letter of invitation to school officials and others concerned. It began:

"You and I are faced with the same problem—building or remodeling.

"With the tremendous amount of money being spent or appropriated for new and improved school plants, we thought it most desirable to have an educator's conference

Electric Cooking Equipment In Turner Junior High School

Cafeteria Equipment	Kw	Hp
2 Commercial Ranges	24	
2 Roast and Bake Ovens	12.4	
1 Food Server	3.36	
1 Twin Coffee Urn	7	
1 4-Slice Toaster	2.45	
1 44-cu ft Refrigerator		1/3
1 8-hole Ice Cream Cabinet		1/4
1 Salad Service Counter		1/2
1 Water Cooler		1/3
1 Dish Pre-Wash and Garbage Disposer		3/4
1 Dishwasher	5	3/4
1 Booster Water Heater for Dishwasher	13.7	
1 20-qt Mixer		1/2
1 Exhaust Fan		3
1 Food Chopper and Slicer		3
Space and wiring are provided for early installation of additional equipment:		
1 Frozen Food Storage Cabinet		1/3
1 6-burner Cooking Top	12	
1 Deck-type Oven Section	6.2	
1 60-lb Fry Kettle	12	
1 Potato Peeler		1/2
Home Economics Department Equipment		
5 Residential Ranges	50	
3 Residential Refrigerators		1/2
6 All-electric Sinks		3
2 Sinks with Booster Heaters	4	1
Additional to cooking facilities are laundry and dressmaking equipment:		
1 Automatic Washer		1/3
1 Electric Clothes Dryer	4	
1 Ironing Machine	1.4	
6 Electric Irons	6	
6 Electric Sewing Machines		
Totals	**164.4**	**12.08**

Total connected load amounts to at least 175 kw

STUDENTS LEARN to select foods and prepare well balanced meals in the nine kitchen units, a small group working in each one. They are instructed in how to use electric ranges, refrigerators, dishwashers, mixers, and many other kinds of kitchen equipment

READY for the cafeteria rush. Thermostatically-regulated warmers and refrigerated cabinets hold food just right

PROPER USE of washers, dryers, and ironers is taught in a complete electric laundry unit as in a modern electric home

dealing with the planning and development of home economics classrooms and cafeterias, especially since the new Harry B. Turner Junior High School has just recently been completed and opened in the city of Warren. The building contains ultra-modern home economics and cafeteria units, as well as many other fine features."

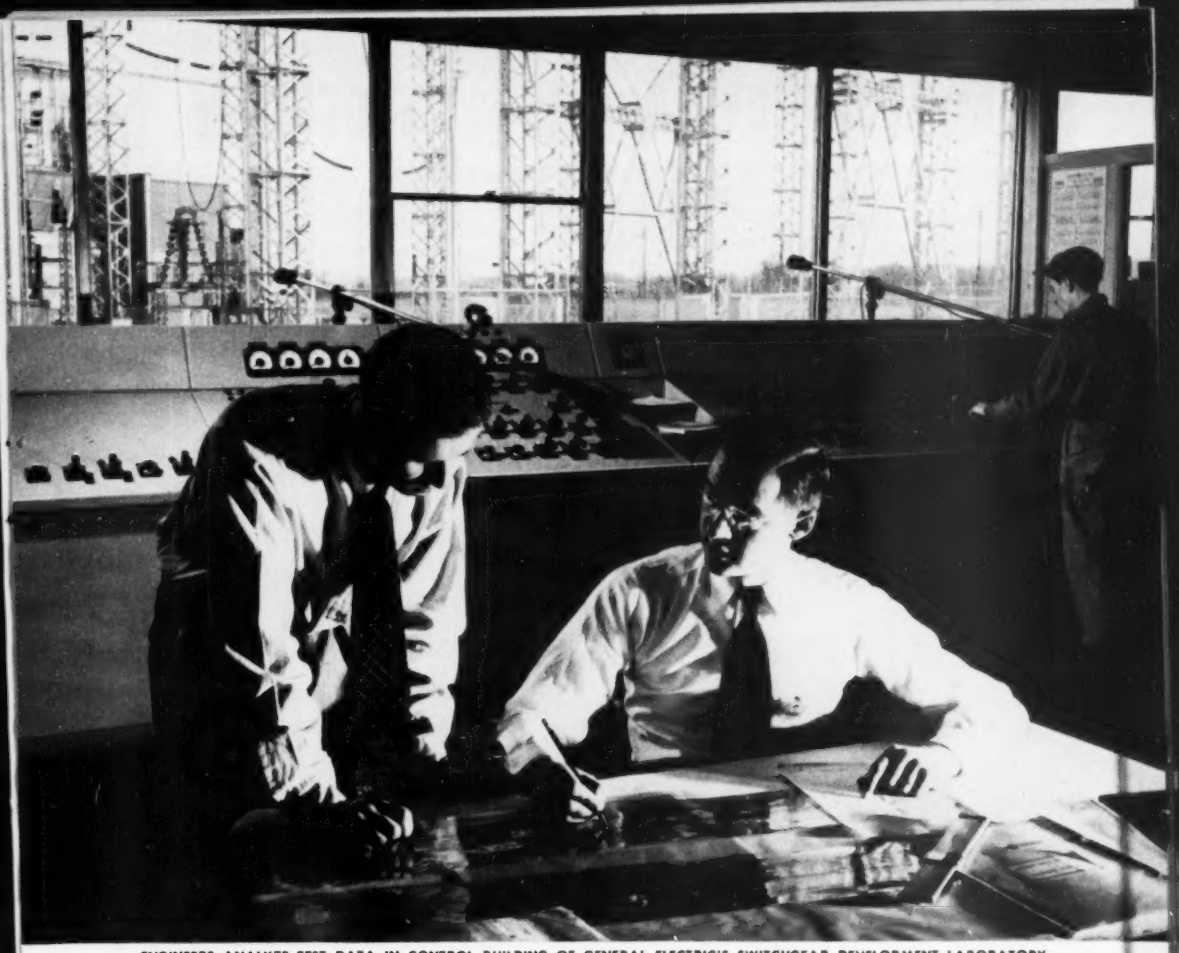
Previously, Ohio Edison representatives had sounded out members of the State Board of Education and the administrative staff of Ohio State University in respect to the proposed conference. A tentative program was discussed with them. They agreed to support the conference and to furnish speakers. Formal requests to appear on the program were sent by Mr. Miller to the suggested speakers. Obtaining interested backing in, and the speakers from, these high places in the educational field gave to the conference authority and prestige of great value in attracting attendance.

And attendance was attracted. There came, listened, and looked:

Architects and consulting engineers	62
Superintendents of schools	42
School business managers	6
School principals	22
Home economics supervisors	15
School cafeteria managers	35
Home economics teachers	83
School board members	25
Others	57
Representatives of parochial schools	5
Colleges: Home economics instructors, business managers, and cafeteria supervisors	11
Total	363

Comments of those attending the conference were most commendatory of the electrical facilities provided for teaching home economics and for feeding pupils. From such expressions, it can be expected confidently that thinking on the design of many future home economics classrooms and school cafeterias will be strongly affected in favor of electricity. State school authorities are very enthusiastic. They consider it an outstanding example of what can be accomplished when educators, architects, and cooperating agencies give intensive study to the requirements of home economics teaching and provision of meals for pupils, and then plan intelligently to meet those requirements with modern facilities.

DRESSMAKING and other sewing are also taught in the home economics department which contains six electric sewing machines. Good lighting is all-important here to prevent unnecessary eye straining in close needlework



ENGINEERS ANALYZE TEST DATA IN CONTROL BUILDING OF GENERAL ELECTRIC'S SWITCHGEAR DEVELOPMENT LABORATORY

Multimillion KVA "Fact-Finder" points way for the power industry's rapid expansion

New Switchgear Development Laboratory has world's highest capacity testing facilities

At their new Switchgear Development Laboratory at Philadelphia, General Electric engineers are superbly equipped to get vital new facts on switchgear performance. The laboratory is a multimillion kva "fact-finder" that will speed the development of switchgear able to safely harness and control the tremendously greater power needs of tomorrow.

G-E development engineers—who have already made over 300,000 proof tests of switchgear since 1921, at previous G-E test laboratories—are enthusiastic about their new laboratory for two main reasons:

First, they can make more searching tests than ever before possible—with a short-circuit capacity of 5,250,000 kva asymmetrical, 3,200,000 kva symmetrical, three-phase, at 15.5 kv.

Second, they can now make tests at a much faster tempo. Testing procedures, formerly time-consuming and even laborious, are run off on a precise, fast-moving basis with the help of electrical and mechanical aids. As one G-E engineer remarked, "By clipping minutes off routine steps all day, every day, we can help clip months off major switchgear developments."

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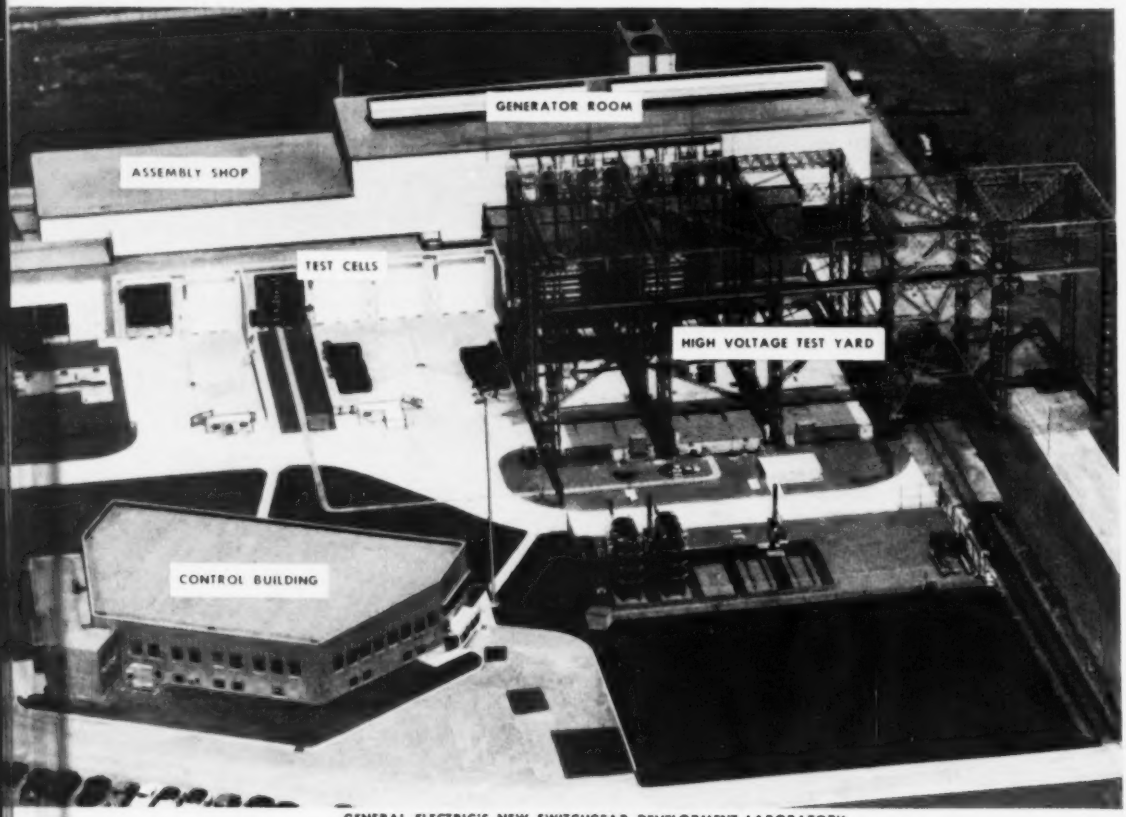
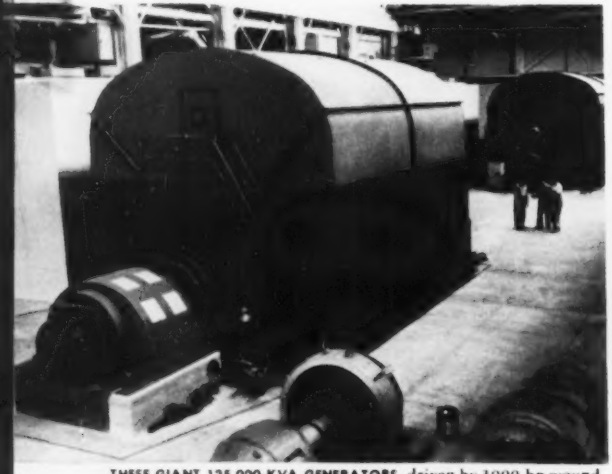
GENERAL ELECTRIC

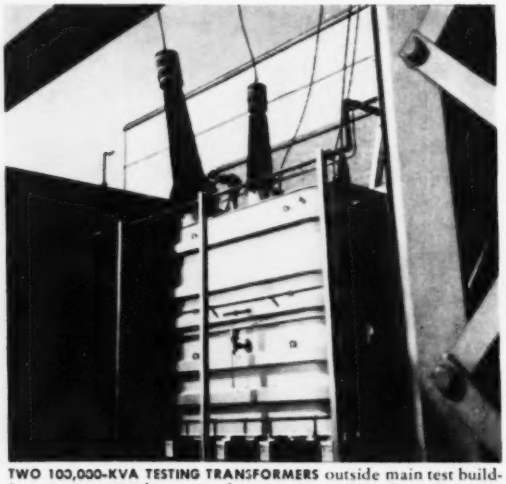
New G-E Development Laboratory gets



GENERAL ELECTRIC'S NEW SWITCHGEAR DEVELOPMENT LABORATORY

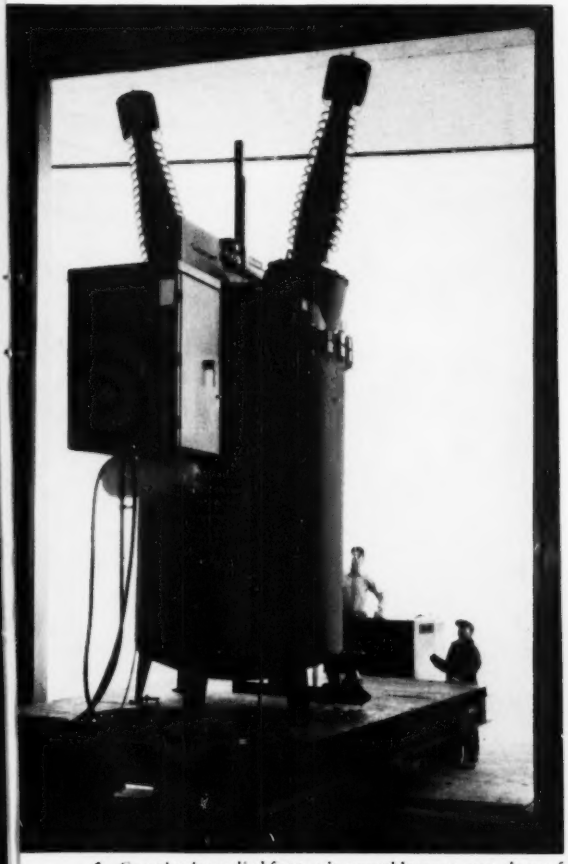


THESE GIANT 125,000-KVA GENERATORS, driven by 3000-hp wound-rotor induction motors, are the largest generators that have yet been built for short-circuit testing.



TWO 100,000-KVA TESTING TRANSFORMERS outside main test building step up 15.5-kv power from generators to give voltages as high as 440,000 for high-voltage tests.

new facts on switchgear performance

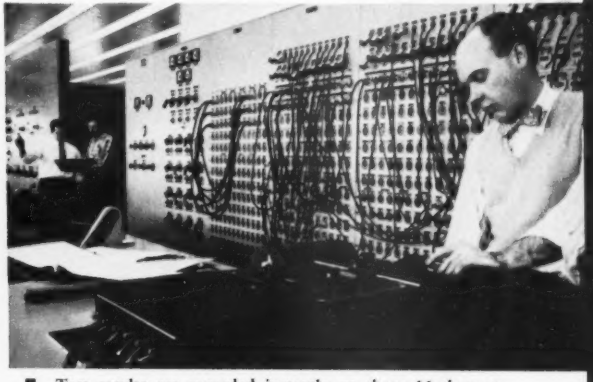


1 Completely readied for test in assembly room, one phase of a power breaker goes to the high-voltage yard where, minutes later, it will be connected and the test completed.

3 Operator establishes sequence and timing of all steps of the test on this selector panel. Closing of the test circuit is accurately timed to within 5 electrical degrees.

4 Operators initiate automatic test sequence from this control benchboard, after checking all safeguards, giving final warning signal and adjusting the generator voltage.

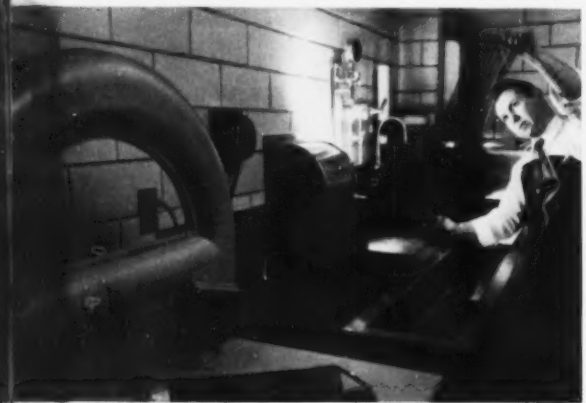
2 Test circuit is set up from the switchboard, above, in control building. Circuit diagram, with indicating lights, enables operator to visualize the entire test circuit.



5 Test results are recorded instantly on these 11-element magnetic oscillographs in control building. Plug board connects oscillographs to appropriate measuring devices.

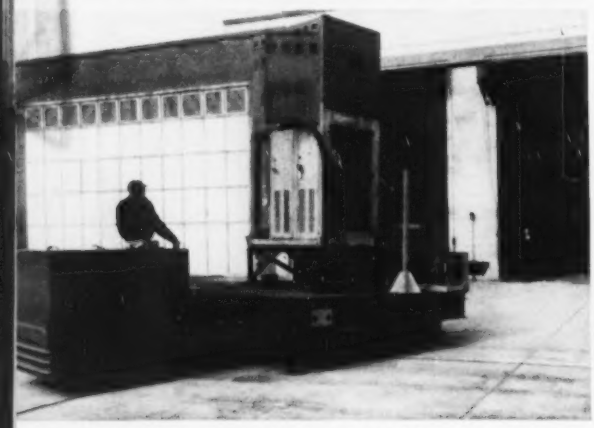
6 Cathode-ray oscillographs near the test area record transients too fast for magnetic oscillographs to follow.

7 The cathode-ray oscillograph film is rushed to darkroom in control building by underground pneumatic tube.

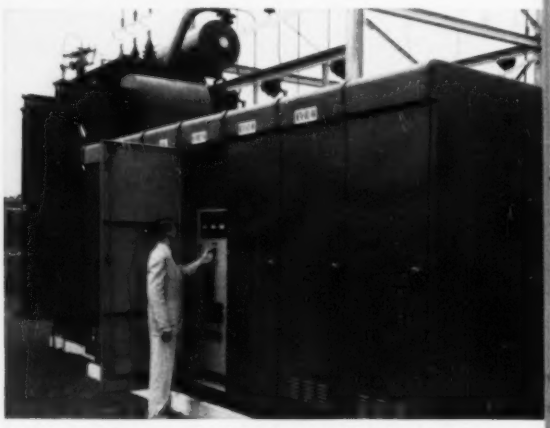


8 Oscillograph films, developed immediately in this modern, fully equipped darkroom give detailed records of test.

9 Engineers examine still wet films within two minutes after test. Results help develop such equipment as these . . .



10 Air-blast station breakers on special test car on way to be tested in cells provided for tests under 15.5 kv.



11 Magne-blast power circuit breakers for G-E unit substations will also be proof-tested in these test cells.

GENERAL ELECTRIC

OCB Operation Unaffected by DBPC

DR. W. M. LEEDS, Manager, Circuit Breaker Development, Switchgear Division, Westinghouse Electric Corp, East Pittsburgh, Pa.

R. F. SEUBERT, Manager, Oil City Products Branch, Chemical Division, Koppers Co, Inc, Pittsburgh, Pa.

The use of oxidation inhibitors in insulating oils, particularly for transformers, has been recommended to increase the life of the oil with respect to formation of acids and sludge at elevated temperatures. Many utilities use insulating oil interchangeably in both circuit breakers and transformers, and questions have arisen regarding possible effects of the inhibitor when the oil is subjected to arcing during breaker switching duty.

Conflicting reports regarding the comparative rate of carbon particle settling after arcing in either inhibited or non-inhibited oils used in circuit breakers have led to investigation of this and other effects on circuit breaker performance.

A 14.4-kv, 250,000-kva oil circuit breaker was used for these tests, during which samples of both inhibited and uninhibited oil were arced.

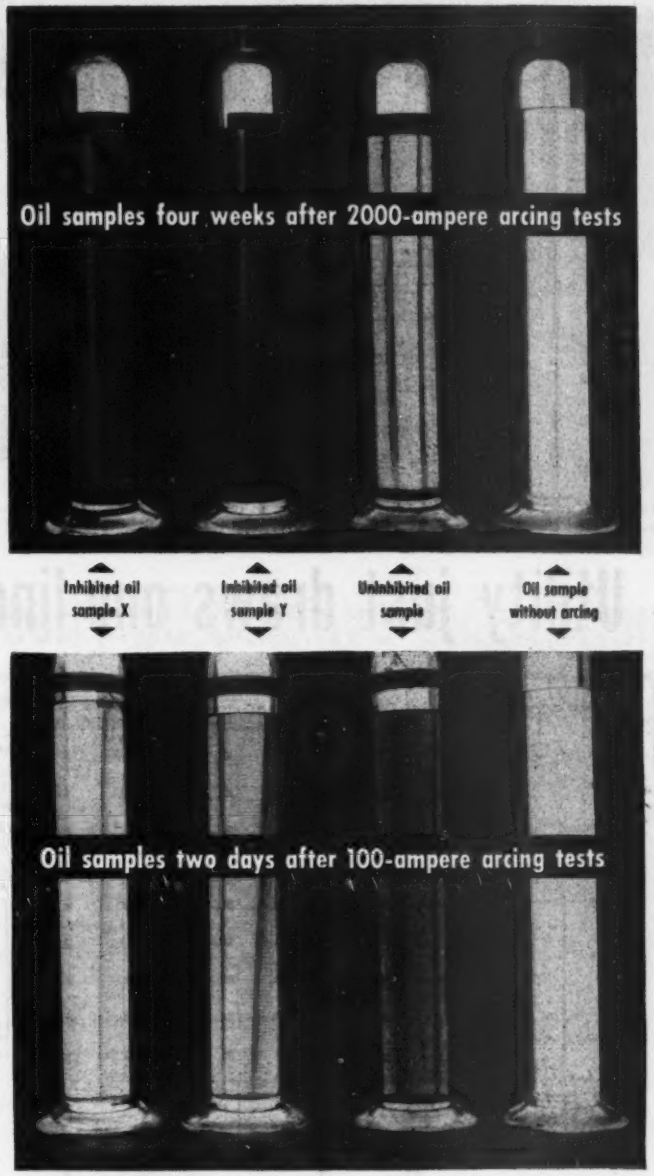
Variables investigated were: (1) current magnitude in the arc (low currents of 100 amps vs high currents of 2000 amp), (2) arcs drawn in open oil vs arcs in contact with fiber interrupted assemblies, (3) the effect of a small quantity of water added to the oil, and (4) a comparison of two types of inhibited oils from widely different crude oil bases both containing di-tertiary-butyl-para-cresol (DBPC).

A general conclusion can be made that the performance of an oil circuit breaker is practically unaffected by the use of an oxidation inhibitor of the DBPC type insofar as arcing time, rate of gas generation, rate of carbon formation, or rate of dielectric change is concerned.

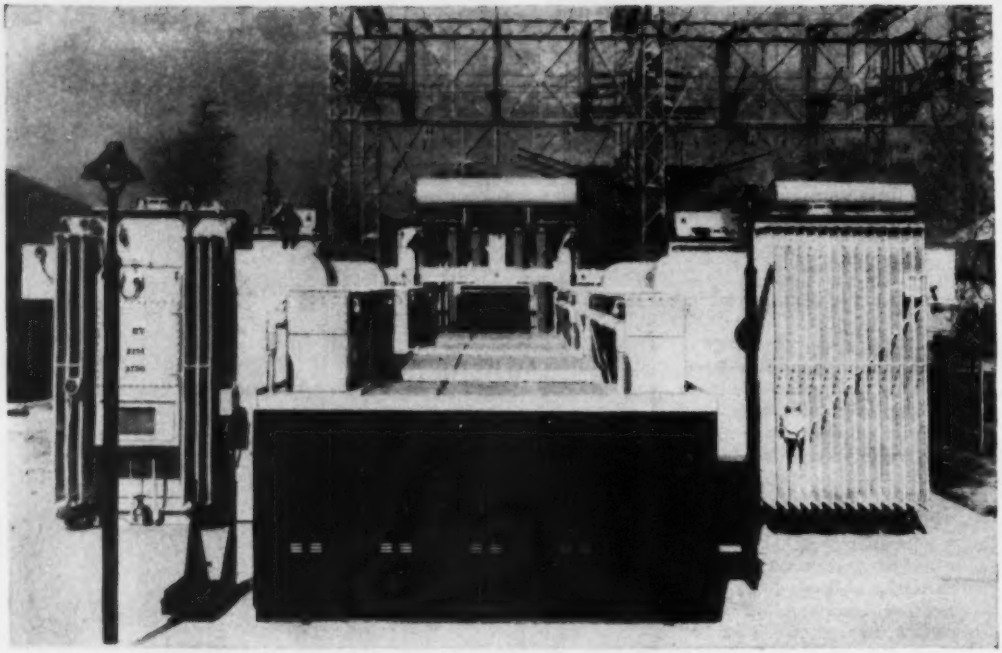
With respect to rates of carbon settling, differences could be noted only after arced oil samples had stood for several days.

The slight effects that were then observed could hardly be considered to show a consistent trend, since the

(*Continued on page* 106)

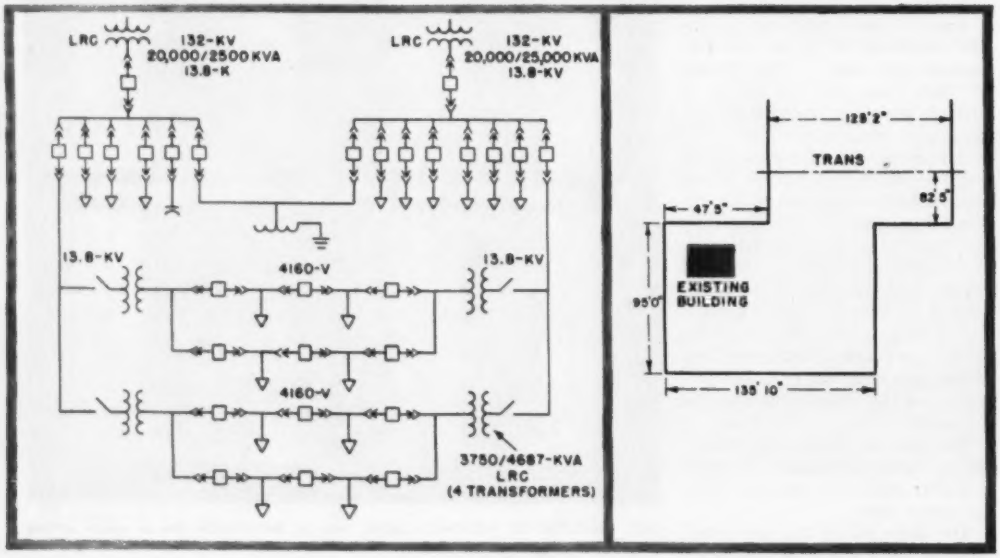

Oil samples four weeks after 2000-ampere arcing tests
Inhibited oil sample X
Inhibited oil sample Y
Uninhibited oil sample
Oil sample without arcing
Oil samples two days after 100-ampere arcing tests

DBPC INHIBITED OIL subjected to arcing shows no characteristic rate of carbon settling under the usual variety of operating conditions. This conclusion is evidenced by the fact that carbon settled faster in inhibited oils during the 100-amp arcing tests, just the reverse of the condition observed in the 2000-amp tests. In the 100-amp test both inhibited oil samples appeared clearer than the uninhibited oil samples after standing only two days

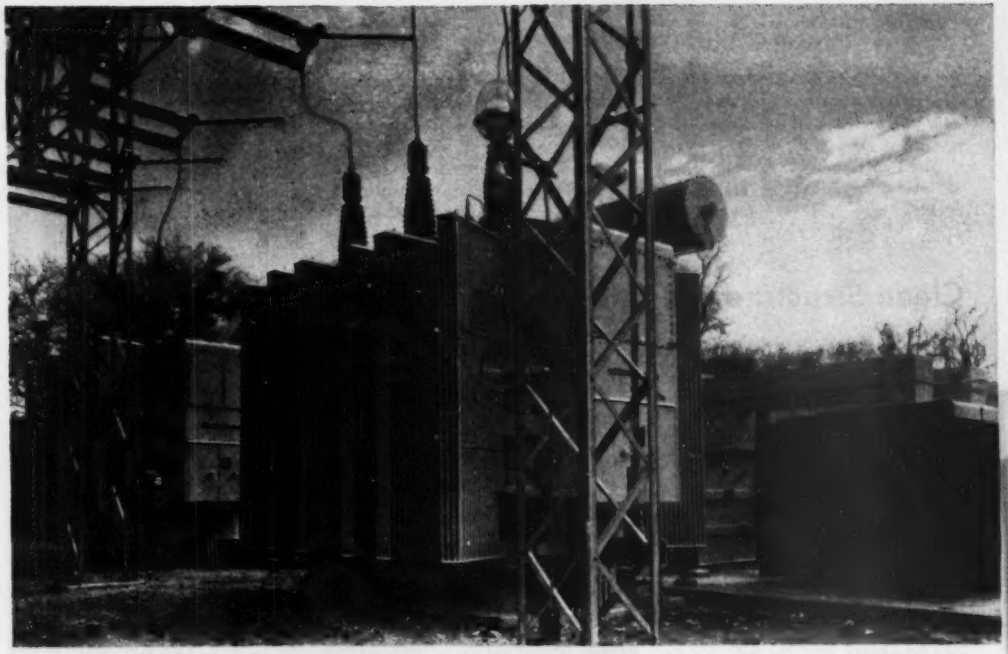


SAN ANTONIO'S 10TH STREET SUBSTATION, one of the largest built by General Electric, is rated at 40,000/50,000 kva, serves its area through nine outgoing 13,800-v feeder circuits in addition to eight 4160-v circuits fed from duplex units.

Utility just draws one-line diagram and



PLANS FOR UTILITY EXPANSION begin with these drawings. A one-line diagram, shown at left, and a simple plot-plan are all that G-E engineers needed to start work on big unit substation for San Antonio. Installation was completed in record time.



LOAD RATIO CONTROL in 25,000-kva transformers provides bus regulation for the 13,800-volt feeders, two of which feed double-duplex units. LRC in duplex units regulates each pair of 4160-v feeders. The substation supplies downtown San Antonio.

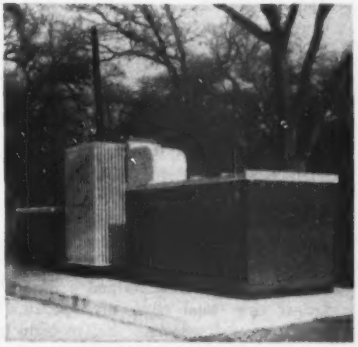
plot-plan to specify 50,000 kva substation

An example of fast, low-cost expansion with G-E unit substations.

The 10th Street substation in San Antonio was planned to feed the city's rapidly expanding system. The utility found it had only to furnish General Electric a simple plot-plan and one-line diagram—similar to those shown at the left—to get the job started fast.

Working from these drawings, General Electric easily and quickly provided a large, double-duplex master unit substation, rated at 40,000/50,000 kva. This standardized equipment answered space requirements as well as the needs of the utility's fast-growing loads.

The City Public Service Board's experience with this G-E substation is further evidence of the trend to standardized equipment in utility expansion programs. G-E unit substations, with their great flexibility, find application in a variety of system arrangements. For full information, write for Bulletins GEA-3800 and GEA-4500. *General Electric Company, Schenectady 5, New York.* 321-101



BRACKENRIDGE SUBSTATION: One of 30 similar substations installed on San Antonio's system. G-E equipment simplifies expansion.

GENERAL ELECTRIC

Arcing Tests

(*Continued from page* 103)

inhibitor seemed to hasten the settling process under certain test conditions and retard the settling under other conditions.

The figure shows one group of oil samples four weeks after arcing tests of 2000 amp with fiber interrupters. The uninhibited oil sample and one of the inhibited oil samples show considerable settling while the other inhibited oil sample still is holding most of the carbon in suspension.

In the case of tests at 100 amperes, both of the inhibited oil samples appeared clearer than the uninhibited oil samples after standing only two days. Where water was added, however, the carbon settled in just a few days in both inhibited and uninhibited oil.

It has been concluded that DBPC inhibited oil subjected to arcing apparently shows no definite characteristic with respect to the rate of carbon settling under the usual variety of operating conditions, and except for cost is fully equivalent to uninhibited oil for use in circuit breakers.

Clean Structure Provides Safe and Easy Switching

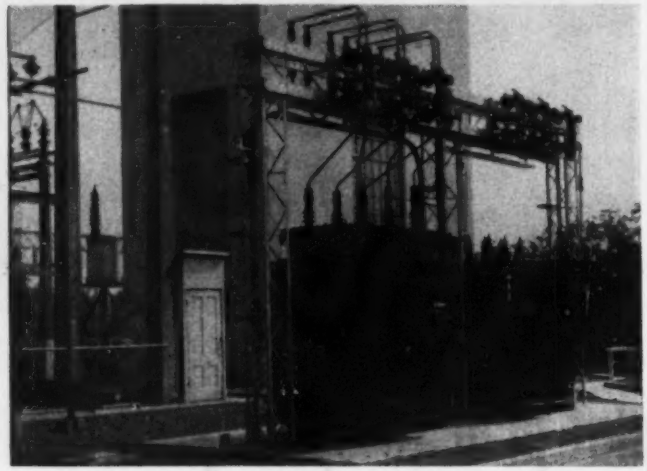
H. A. DILBERGER, Substation Engineer, Pacific Gas and Electric Co, San Francisco

Safer and simpler switching operations are possible as the result of simplified steel structure to mount bypass and disconnect switches serving 12-kv, outdoor regulators. Designed by Pacific Gas and Electric Co, the new structure is less expensive to erect and presents a better appearance than the pipe-frame structure formerly used.

The new structure mounts three bypass load-break switches with arc interrupting devices over each regulator. Masts are of welded construction and are bolted to channels set in the foundation slab.

Horizontal channels are joined and held in position by steel-strap spacers along the top and bottom and by light V-channels diagonally along the sides. This horizontal structure is bolted to the masts in the middle and at both ends.

A narrow platform at the rear of the horizontal structure provides a support for the vertical cable leads to the switches.



NEAT AND SAFE are the advantages of this simple steel structure for mounting by-pass and disconnect switches serving 12-kv regulator. Platform in rear supports cable leads

Neatness, safety, and simplicity are the advantages of this steel disconnect switch structure.

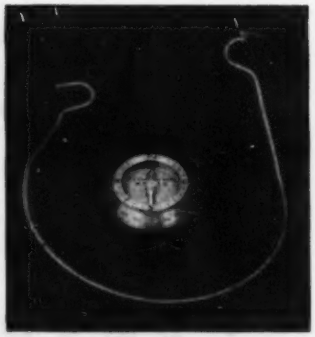
Locate Cable Faults with Simple Low-Cost Device

C. W. CORNFORTH, Public Service Electric & Gas Co, Newark, N. J.

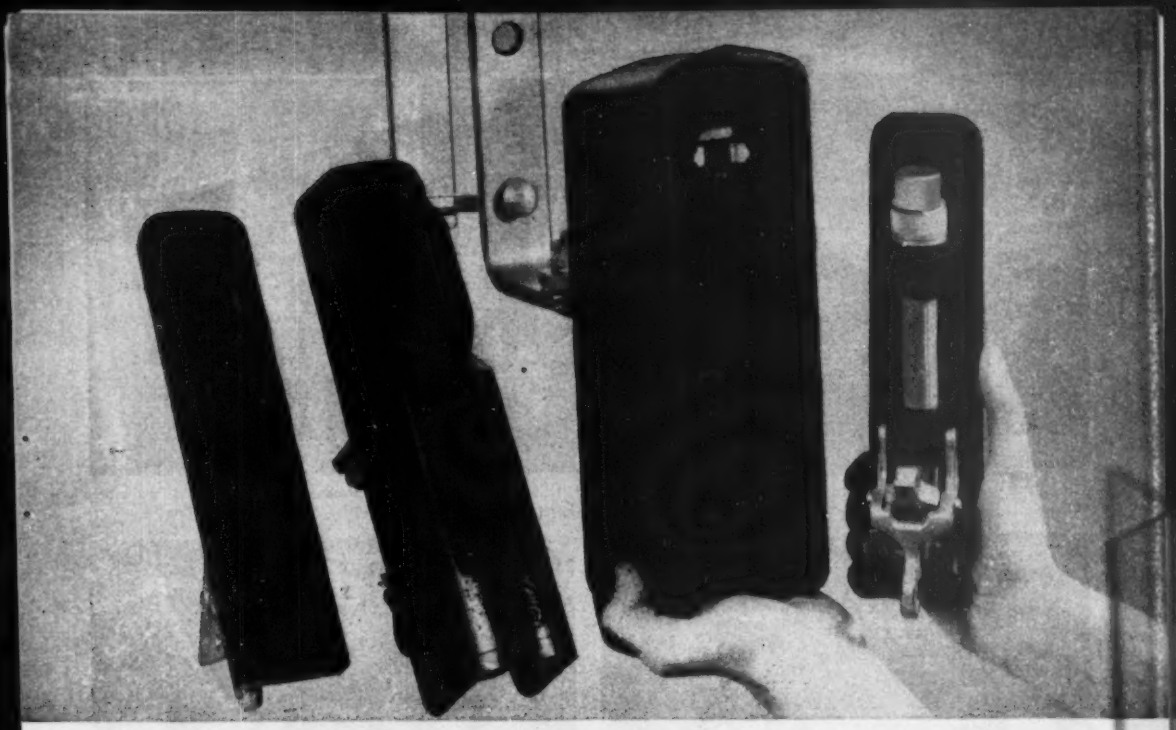
A fault locator based on an extremely simple principle has proved reasonably effective on the Public Service Gas and Electric Co's system. Consisting of a compass and a messenger ring, total cost only 98¢, it works on the principle that a fault current will magnetize iron.

This method may find widespread use on underground systems that are not sufficiently extensive to justify expensive fault locating equipment. It must be remembered that this method should not be used when any doubt exists that the station breaker will not trip when reclosed deliberately. Also, there should be no chance of fault damaging other feeders in manhole.

In practice, a strategic point on the faulted circuit is selected. This could be a manhole where the circuit branches off into many directions. With the disconnect closed on the faulted phase only, the station breaker is closed. It will trip out immediately, but the fault current will have magnetized one of the messenger rings encircling the branches in the manhole. The rings are then tested with the compass, and the one that is magnetized will be on the faulted phase. The procedure is repeated at another point farther out on the feeder. Three tests usually will locate the fault.



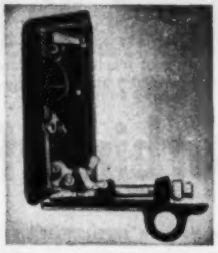
CABLE FAULT LOCATOR consists of nothing more than a Boy Scout compass and a steel messenger ring used with aerial cables



Four cutouts in one

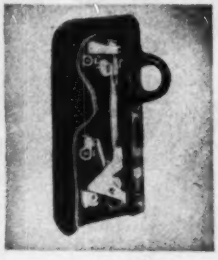
by simply changing doors

Indicating



Drop-out

Reclosing



Disconnect

A G-E FEATURE SINCE 1937! By stocking only three interchangeable doors which fit both 5.2- and 7.8-kv, 50-ampere housings, you get the 4 operating functions illustrated at the left. Available also in 100-ampere ratings, this unique flexibility reduces inventory and simplifies stocks.

INDICATING OR DROPOUT WITH A TWIST OF THE WRIST! A small wire yoke, easily inserted or removed, determines whether the fuseholder door "kicks out" at the bottom for visual indication, or drops open—either way giving positive evidence of a blown fuse.

RECLOSING DOOR AVOIDS UNNECESSARY SERVICE TRIP! The two-element reclosing door restores service within one second after a temporary fault blows the first fuse link. By saving a service trip, the two-shot cutout pays for itself the first time it operates!

FLEXIBLE DISCONNECT BLADE CAN'T GET LOST! It's fastened to the door—can't be misplaced. This disconnect blade doubles the continuous current rating of the cutout. When the blade is disconnected and the door closed, the flexible cable extends downward to indicate that the circuit is open.

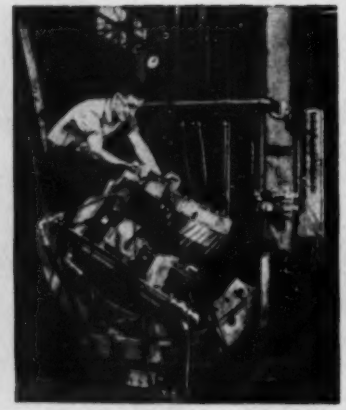
WHAT'S MORE THE CUTOUT IS LIBERALLY DESIGNED —has high dielectric strength, uses silver-plated contacts, provides full-range interruption of fault currents, and is conservatively rated. All live parts are completely enclosed for maximum safety.

For complete information contact your G-E Apparatus sales representative, or write for Bulletin GEA-3448. General Electric Company, Schenectady 5, N. Y.

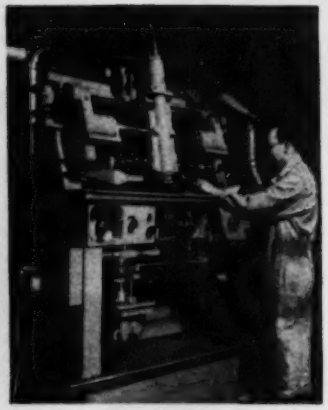
40E 41

GENERAL ELECTRIC

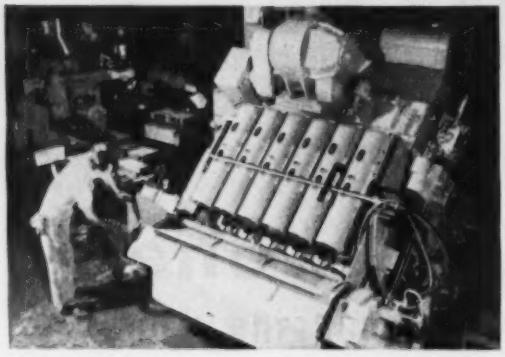
This accuracy check on turbine bucket dovetails is one of many quality controls.



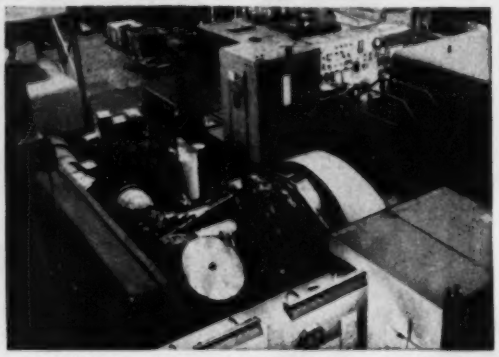
Automatically operated, this three-station broach cuts dovetails in compressor wheels.



An automatic polisher brings machined compressor blades to their final contour.



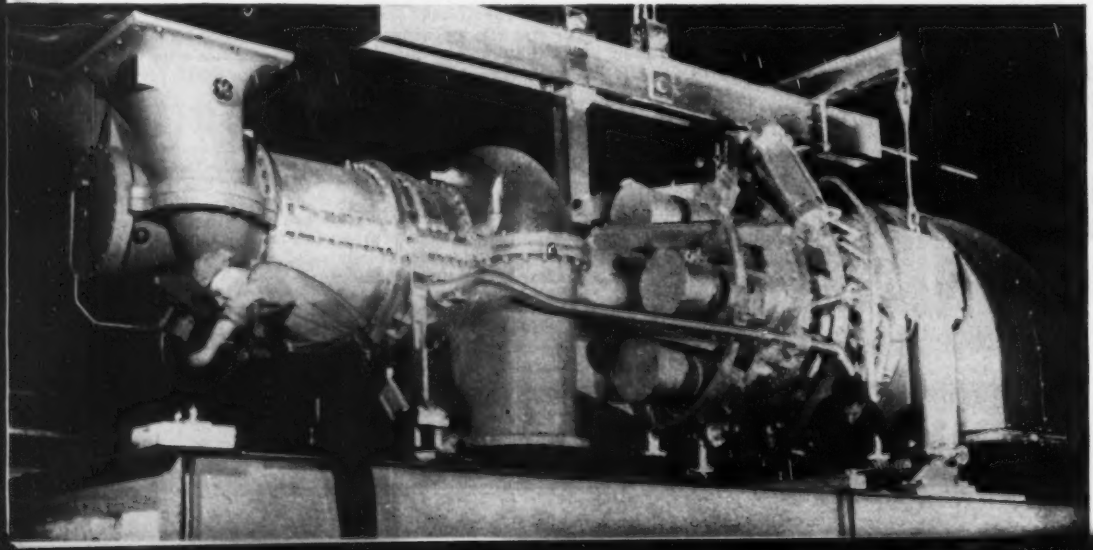
This machine simultaneously cuts six compressor blades or turbine buckets from blank stock to within 0.005 in. of finished dimension.



Testing includes checking of mechanical balance, performance, bearing operation and emergency and speed regulating governors.

General Electric's Gas Turbine Plant

ASSEMBLED UNITS LEAVING THE FACTORY ARE READY FOR PERMANENT INSTALLATION WITH A MINIMUM EXPENDITURE OF TIME AND LABOR.



One of the bays in General Electric's gas turbine plant at Schenectady, N. Y. Units are being assembled for locomotive, pipeline pumping, and power generation service.

Now Tooled for Continuous Production

With the recent addition of a number of specialized machine tools, General Electric's gas turbine manufacturing facilities are virtually complete. Production, testing, and shipment are on a regular schedule in the Schenectady, N. Y., plant. In fact, the 1952 order board calls for delivery of 46 units—six for freight locomotives, 34 for natural gas pumping stations, and six for power generation service in electric utilities. An even larger total will be produced in 1953.

Components for the 3500 kw simple-cycle, the 3500 kw regenerative-cycle, and the 5000 kw compound-cycle designs are in continuous production.

Recently, the first regenerative-cycle machine completed factory tests and is now being installed. This design, distinctive for its flexibility, is suitable for utility application in a variety of arrangements involving the combined use of both gas and steam turbine cycles.

Of particular importance are the refinements in manufacturing procedures which have come about as the result of operating experience with half a dozen units in customer installations. A large fund of data on fuels, design details, and performance has been accumulated.

Thus, in less than five years, a completely new development has become an established product. America's newest prime mover is making a significant contribution to the nation's over-all program for power expansion. General Electric Company, Schenectady 5, N. Y. 233-6

GENERAL ELECTRIC

Aluminum Triplex Service Connection At Building Entrance

A method developed for making triplex aluminum service connections at the building is adapted from specifciations in "Advance Information Sheets" of Detroit Edison Co

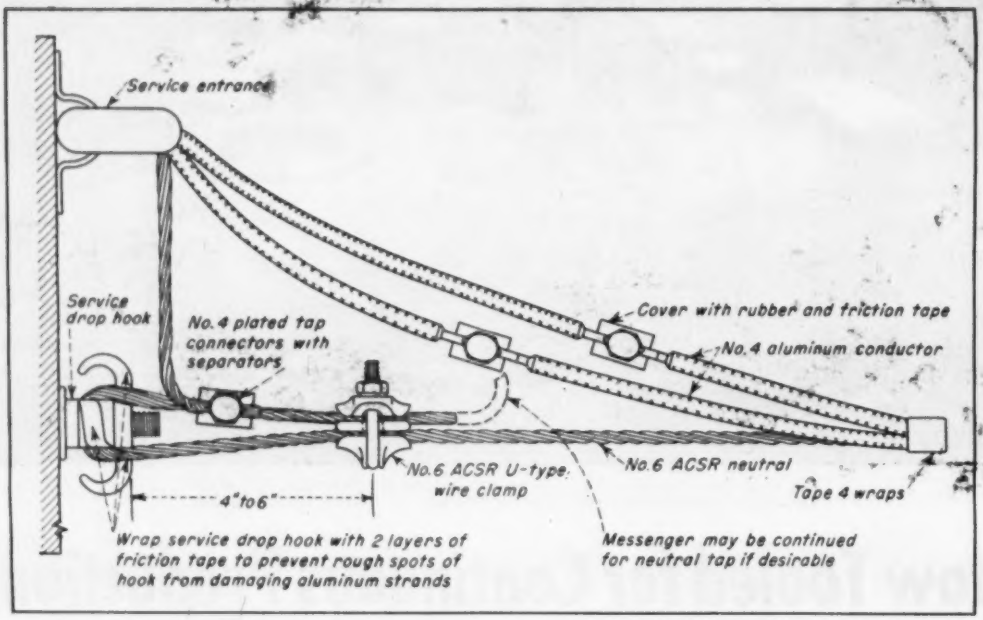

Service entrance
Service drop hook
No. 4 plated tap connectors with separators
Cover with rubber and friction tape
No. 4 aluminum conductor
No. 6 ACSR U-type wire clamp
No. 6 ACSR neutral
Tape 4 wraps
4" to 6"
Wrap service drop hook with 2 layers of friction tape to prevent rough spots of hook from damaging aluminum strands
Messenger may be continued for neutral tap if desirable

Fig 1—Service drop deadened on hook

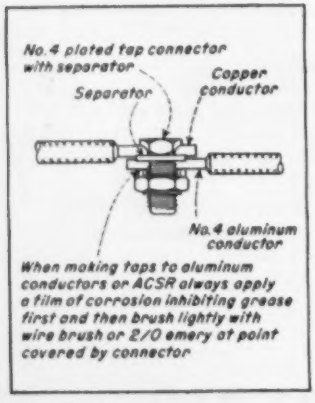

No. 4 plated tap connector with separator
Separator
Copper conductor
No. 4 aluminum conductor
When making taps to aluminum conductors on ACSR always apply a film of corrosion inhibiting grease first and then brush lightly with wire brush or 2/0 emery at point covered by connector

Fig 2—Service tap at building

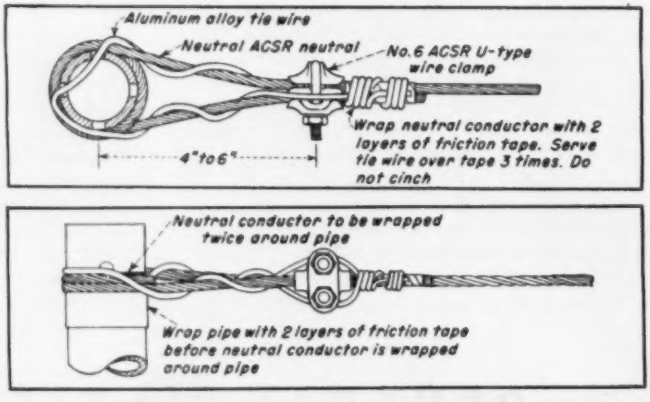

Aluminum alloy tie wire
Neutral ACSR neutral
No. 6 ACSR U-type wire clamp
Wrap neutral conductor with 2 layers of friction tape. Serve tie wire over tape 3 times. Do not cinch
4" to 6"
Neutral conductor to be wrapped twice around pipe
Wrap pipe with 2 layers of friction tape before neutral conductor is wrapped around pipe

Fig. 3—Messenger deadened on pipe riser; (upper) plan view, (lower) horizontal view

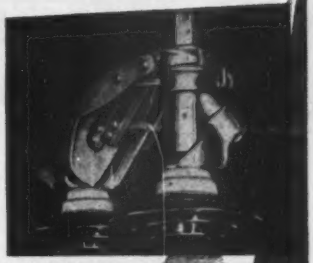
Let's look at the "MK-40" BLADE MECHANISM

Designed to give you smoother operation —longer service

One 45-degree blade actuating mechanism replaces arrangements of cranks, levers, links and cams so common on ordinary switches . . . converts motion of operating insulator to a vertical lifting and rotating motion of the blade in just the right sequence and with just the right mechanical advantage. Blade is under positive control at all times. Toggle effect of the mechanism locks the blade in fully closed and fully open positions.

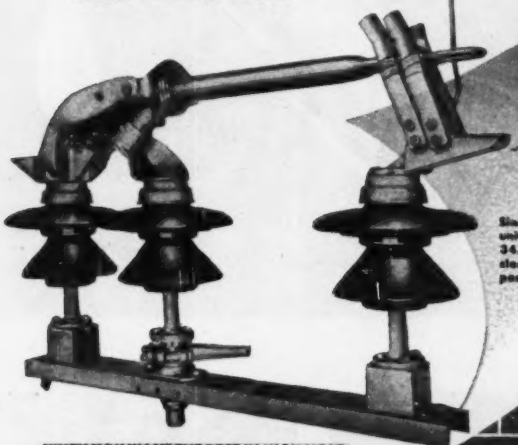
This mechanism incorporates a factory sealed greaseless bearing assembly of the double race ball type requiring no field adjustments. It develops enormous leverage in initial opening and final closing; where it is most necessary to break ice accumulation or corrosion. Variation in leverage equalizes the gravitational pull on the blade and results in a smooth uniform operational effort. That's why the "MK-40" switch is so easy to operate under all weather conditions.

Ask for Publication 4807.

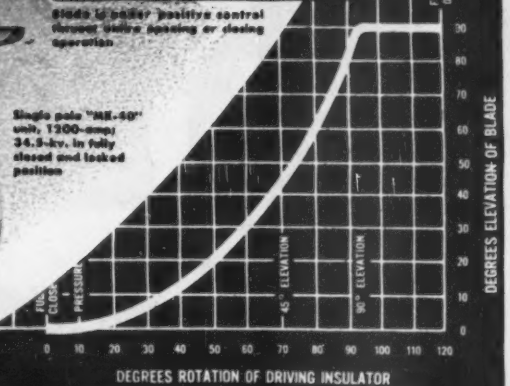


Mechanism bearing post closed position, blade is securely locked in open position

Blade is under positive control through entire opening or closing operation



Single pole "MK-40" unit, 1200-amp, 34.5-kv, in fully closed and locked position



WHEN YOU WANT THE BEST IN HIGH VOLTAGE SWITCHES SPECIFY THE "MK-40"

DELTA-STAR ELECTRIC COMPANY

DIVISION OF H. K. PORTER COMPANY, INC.

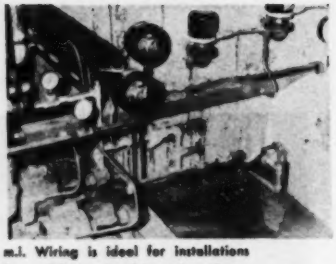
2437 Fulton Street • Chicago 12, Illinois

DISTRICT OFFICES IN PRINCIPAL CITIES

MOISTURE PROOF

SAFETY
MINERAL m.i. INSULATED
WIRING
PYROTENAX
A GENERAL CABLE PRODUCT

SAFETY m.i. WIRING*
is available with
fittings to connect
to standard boxes
and equipment.



Being completely moisture-proof, Safety m.i. Wiring is ideal for installations in moisture-filled meat packing houses (shown left), and refrigeration plants.

*Exclusively a General Cable Product

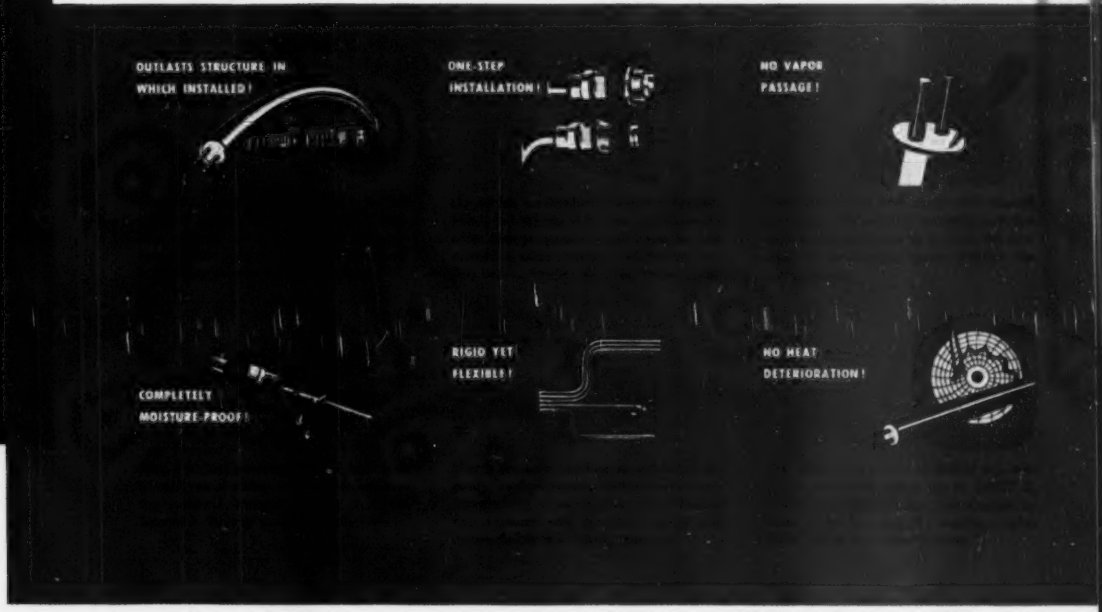
SAFETY m.i. WIRING

is completely impervious to moisture, oils, most acids and alkalies . . . and is unaffected by extremes of heat or cold

Sealed within a continuous copper sheath, the insulation of a Safety m.i. Wiring System affords complete immunity from deterioration in dielectric properties normally caused by the presence of gases, water, oil, solvents or accumulated condensation in confined spaces.

Self-protected, Safety m.i. Wiring offers important advantages beyond this sealed-in imperviousness—particularly in circuits where absolute protection from interruption is essential.

Briefly outlined here, these advantages will prove well worth your closer examination. Write today for our new brochure, "20 Questions & 20 Answers on Safety m.i. Wiring System".



GENERAL CABLE
CORPORATION

EXECUTIVE OFFICES: 420 LEXINGTON AVENUE, NEW YORK 17, SALES OFFICES IN PRINCIPAL CITIES OF THE UNITED STATES

"More Power to You"

GENERAL CABLE GENERAL CABLE

Rig Offers Flexible Control and Ease of Reel Changing

R. M. MIDDLETON, Supt of Transportation and Shops, San Diego Gas and Electric Co

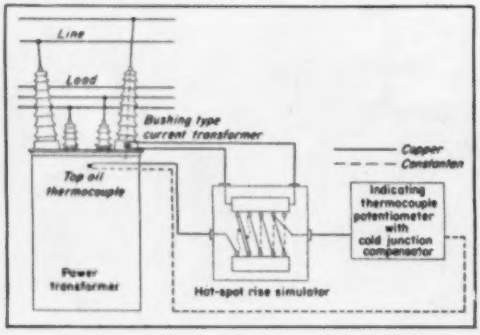
Flexible control over individual reels and ease of changing reels are main features of a power-driven wire pulling rig designed and built by San Diego Gas and Electric Co. The four-reel rig has been used to pull in simultaneously up to 4,000 ft of three 4/0 and one 1/0 conductors.

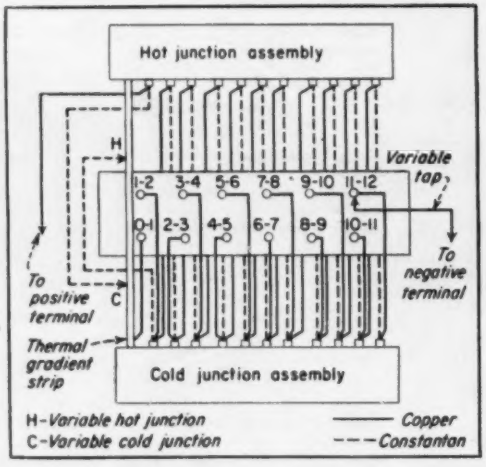
Individual operation of the reels is attained through a common shaft driving four separate internal friction clutches. Each clutch is controlled by linkages which lead to the clutch handles at the engine end of the rig. An automatic brake is set whenever an internal clutch is disengaged and is released when the clutch is re-engaged.

Common drive shaft is powered by an 80-hp engine through a reversible speed changer which permits reel speeds of 1¾ to 19 rpm. Each internal clutch is connected to the worm-gear speed reducers by chain drive. Speed reducers transmit power to reel drive shafts through open clutches. These clutches are locked in operating position by steel straps on the clutch lever.

Use of open clutches instead of internal clutches next to the reel shaft makes the job of changing reels an easier one. It is necessary only to disengage the clutch, remove four cap screws in the reel shaft bearing plates and lift out the reel. Placing a new reel is equally simple.

STRINGING REEL has open clutches between speed reducers and reel drive shaft which permit reels to be changed easily. Reels are controlled individually by operator at engine-end of rig. Up to 4,000 ft of three 4/0 and one 1/0 have been pulled simultaneously





The Hot Spot Rise Simulator

C. F. BOOK and **V. V. MASON,** Professional Engineers

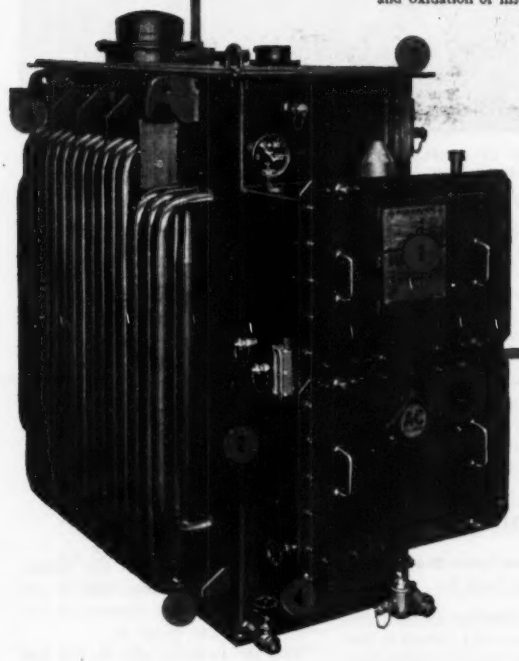
A new technique for measuring hot-spot temperatures in transformers has been advanced by D. A. McKenzie of the Hydro-Electric Commission of Ontario. This technique involves the use of a thermocouple submerged in the top oil of the transformer with its output connected in series with an external thermocouple of similar design. The latter is equipped with a properly lagged heater that carries a current proportional to the current in the transformer windings.

This proportional current is supplied by a current transformer and the heater has provisions for compensating to the characteristics of different transformers.

The actual equipment utilizes an internal copper-constantan thermocouple to measure the temperature of the top oil, and an external device to simulate the rise of the copper temperature over that of the top oil.

The external instrument is essentially a thermopile having the hot junctions heated by current from a standard bushing type transformer. Adjustment of the output is obtained by taps and a vernier on the thermo-

EVERY DETAIL
Designed to Extend Transformer Life!



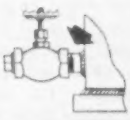
SPIRAL WOUND GASKETS ARE PERFORMANCE-PROVED. In over 5 years of continuous use, spiral wound gaskets have proved their superiority over other types of gasketing material for sealing bushings in the tank wall.

Alternate plies of preformed spring-like metal and non-metallic fillers provide unusual resilience that actually adjusts itself to changes in operating conditions. This gasket, installed without the use of cements or grease, simplifies the removal of bushings if this is required. The gasket may be re-used if necessary.

WELD-SEAL CONSTRUCTION ELIMINATES MAJOR GASKETS. The main cover and switch compartment are welded to the tank to prevent leaks and possible sludging. Oil sludging and oxidation of insulation is minimized.

SPECIAL SURFACE TREATMENT thoroughly protects areas that may be exposed to severe corrosive conditions. Tank surfaces are grit-cleaned and given three coats of baked-on phenolic paint (formulated for moisture resistance). A special bituminous compound gives added protection to surfaces and tubes in base areas.

THREADED VALVE CONNECTIONS are solder-wiped for extra protection. Valves are located to provide maximum accessibility. Globe type valves with nonrotating seats close tight, avoiding wear on valve seats.



EXCELLENCE IN CONSTRUCTION DETAIL goes a long way to help build wide product acceptance. That's just one of the reasons why Allis-Chalmers network transformers are fast-growing in preference and why over 1¼ million kva are now serving on the nation's important utility systems. Allis-Chalmers network transformers' compact, low-loss design and high thermal capacity meet the severest load conditions.

See your local A-C sales representative for more information or write Allis-Chalmers, Milwaukee 1, Wisconsin. A-3777

ALLIS-CHALMERS

pile. This avoids use of a tapped transformer and the attendant difficulties of relatively high steps. The particular voltage desired, equivalent to the temperature rise of the hot-spot over that of the top oil, is derived from the factory heat run at rated current for the individual transformer. This voltage is added to the voltage of the top-oil thermocouple and the sum indicates the hot-spot temperature.

Each thermocouple is essentially a length of resistance ribbon surrounded by thin metal strips. These strips are in close thermal contact but are insulated electrically by mica insulation. The upper assembly carries in its resistance element a current that is proportional to the load current in the transformer windings. The lower assembly carries no current but is identical to the upper assembly to eliminate the possibility of errors due to the ambient temperature changes. Regardless of ambient temperature conditions the upper assembly will be warmer than the lower assembly by an amount dependent on the current in the windings of the transformer.

Maximum Adaptability Provided by New Dispatching Board

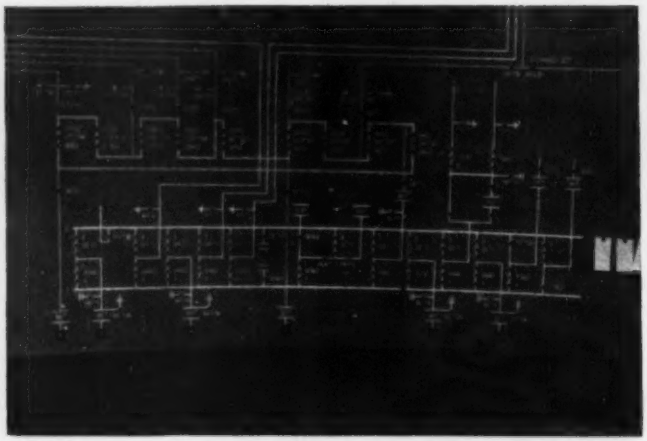
W. H. WELLS, Dispatching Sup't, Connecticut Light & Power Co, Berlin, Conn.

The new load dispatching board of the Connecticut Light and Power Co General Headquarters building at Berlin, Conn, provides for continuous station diagrams of the company's system. Designed by the dispatching department, the board is 36 ft long and describes an arc of 13-ft radius. Panels are ⅛ in. aluminum, 4 ft wide and 10 ft high.

The system diagram was put on with colored adhesive tapes cut to size. A paper tape was used instead of nitrocellulose tape to get a flat color without glare. Symbols for circuit breakers, disconnect switches, transformers, etc, consist of simple geometric figures easily put on or punched from the tapes.

Transmission lines are ⅛ in. wide and station buses ¼ in. wide. The board is coded for voltages in three colors: light green for 115 kv, silver for 69 kv, and light blue for all lower voltages. For dispatching purposes, all feeders under 69 kv are considered as distribution and are handled locally by the company's various district organizations.

Red plugs indicate closed circuit breakers. A green plug indicates an open device, as a switch. To show protective grounds a bright yellow plug is used.



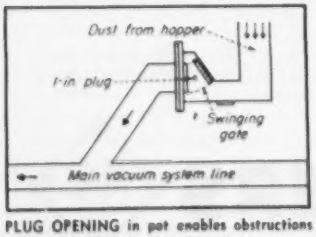
CLOSE-UP SECTION OF PANELS covering Devon steam plant from Company's General Headquarters in Berlin. Perforations, pins, and special tape facilitate changing indications

The flexibility of the board makes it possible to show grounds in the same relative position as applies to their being hung on equipment.

Leased telephone lines multiplied into the main building exchange board connect with all generating stations and switching stations. The dispatcher has absolute priority on use of these lines.

A radio network is in use in case of telephone trouble, with a microwave repeater station on top of a 1000-ft hill located twelve miles away. Two-way contact with all plants and transmission line crews is provided. Soon graphic meters will be in use on frequency, voltage, system plant and inter-utility tie lines.

Opening Simplifies Removal of Dust Pot Obstructions



PLUG OPENING in pot enables obstructions to be located and cleared easily

WALTER LUCIANO, Devon Station, Connecticut Light & Power Co

Considerable trouble encountered with material becoming lodged in the swinging gates on dust pots below the last pass dust hoppers on two boilers at the Connecticut Light & Powers' Devon steam plant led to the method of removal illustrated.

Investigation showed the obstructing material was composed of either boiler brick or common ash clinker which lodged on either side of the gate, thus preventing opening or closure, as the case might be.

With the swinging gate on the dust pot jammed in the open position, the main vacuum line was constantly evacuating the hopper in question, which decreased the effective vacuum available to empty other hoppers until the obstruction could be removed,

...the light of 8,000,000 candles at Your Finger Tips

Stroboscopic study at low speeds, under 600 flashes per minute, requires an intense light which will produce on the eye a sharp, bright image that will stand out in contrast to the image seen under ordinary lighting. The Strobolume provides this *intense* light . . . a light 2000 times as intense as that provided by the ordinary stroboscope. The Strobolume's portability, compactness, accuracy and high intensity light source make it an excellent tool for a wide variety of jobs — It has been successfully used for the study and detection of faulty operation in printing presses, loom shuttles, slow speed metal shop machinery, for the registering of color in printing, for examination of crankshafts, camshafts or countershafts, as a light in single and multiple flash photography, and for the speed determination of any periodic, rotating, reciprocating, or vibrating motion under 3000 rpm.

Write for "EYES FOR INDUSTRY" *for complete information*

TYPE 1532-B STROBOLUME . . . $265

Short Flash — *Each flash lasts only 40 millionths of a second at high intensity; 20 millionths at low intensity position.*

Wide Speed Range — *High intensity: up to 60 flashes per minute, continuous; up to 1200 for short periods. Low intensity: up to 3000 per minute, continuous.*

Versatility in Operation — *Can be flashed from an external contactor, such as G-R Type 1535-A Contactor, or from Type 631-BL Strobotac . . . Cable with pushbutton for manual flashing is provided.*

Built-in Tripping Circuit — *Any simple make or break device controls built-in Strobotron.*

Removable Lamp Housing — *Lamp may be used at end of ten foot cable supplied, to reach otherwise inaccessible locations.*

Safety Feature — *Overload breaker opens circuit when maximum safe operating time is reached.*

Compactness — *7½ x 13 x 11 inches . . . 18½ lbs. overall, lamp assembly only two pounds.*

GENERAL RADIO Company

275 Massachusetts Avenue, Cambridge 39, Massachusetts

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thereby making it possible for the gate to close.

When the gate was jammed in the closed position it was impossible to clear the hopper by using the main vacuum system. This necessitated loosening the bottom plate of the dust pot and allowing the contents of the hopper to drop through to the boiler deck.

At the same time an auxiliary vacuum hose was employed to pick up the material following. After the hopper was completely emptied in this way the obstruction was removed. The time required to do this varied from several hours to a day or more depending on the amount of material which had accumulated in the hopper. In most cases two men using asbestos gloves were needed for this job because of the intense heat in the matrial and the unbearable location of these hoppers.

The difficulty was overcome by drilling and tapping for a 1-in. dia. plug midway between the extreme positions of the swinging gate. Obstructions are now easily removed by using a bent rod, eliminating the former need for emptying the hopper ahead of reaching the obstruction. It has been found that the job can be handled by the operating force on duty when trouble occurs. Maintenance men are no longer diverted from other jobs. On this basis plugs have now been installed on 7 remaining pots.

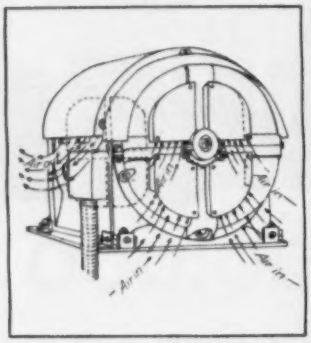
End-Bell Shields Protect Open Motors

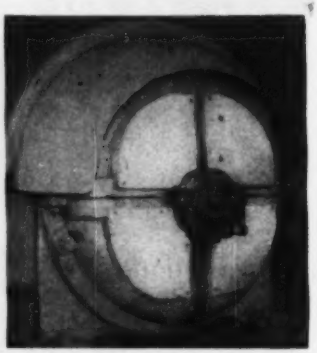
MARK HORN, Electrical Maintenance Dept, The Ohio Power Co, Philo, Ohio

Since the addition over three years ago of end-bell shields to two open self-ventilating motors which drive coal crushers the motors have not failed, and very little maintenance has been required. The expedient is used pending a better solution of the problem.

These motors are rated 200 hp, 440 v and have integrally built ventilating fans. Formerly the dust-laden air was drawn in by the ventilating fans and acted somewhat like a sandblast, eroding the insulation.

Technically, enclosed fan-cooled motors might be justified for this service, but economically there was a serious question so open-end-bell motors had been installed. The protective expedient is illustrated and explained. Sheet-iron shields are mounted to allow entrance and discharge of adequate ventilating air. They subject the incoming air current to a sharp change in direction which tends to throw out the suspended abrasive particles before they enter the motor. The deflected particles fall outside the motor. Incidentally these shields also make it more difficult to damage the motors, either through sabotage or accident in which external objects may get into machine.





AIR INLETS ON END BELLS shield open motor from coal dust. The 20-gage sheet-iron shields leave a 1 ¼ in. opening across bottom between end-bell ribs, giving 54 sq. in. for entrance of ventilating air. Top shields cover those end bell openings so coal dust cannot enter by gravity

Plenty of air apparently enters the motor because tests show no excessive heating, the motor load has not been increased appreciably by the baffles, and the thermal-overload relay has not tripped since making this installation. Furthermore, no particles of coal have been found on the motor windings, no insulation erosion has been observed, and very little maintenance has been required.

Installation of the shields required about 16 man-hours for each unit.

Condenser Tube Leaks Located Quickly

LEONARD WILLIAMS, Chemist, Pacific Gas and Electric Co, San Francisco

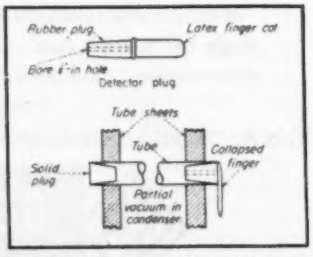
Leaking tubes in steam condensers are located quickly and easily by a method used in steam-electric stations of Pacific Gas and Electric Co. Only two devices are needed to test one tube, a solid rubber plug and another rubber plug with a hole through the middle and a latex finger cot stretched over one end.

To test a tube, the solid plug is inserted tightly in one end and the other plug in the opposite end. The finger will collapse if there is a leak due to the partial vacuum in the steam condenser.

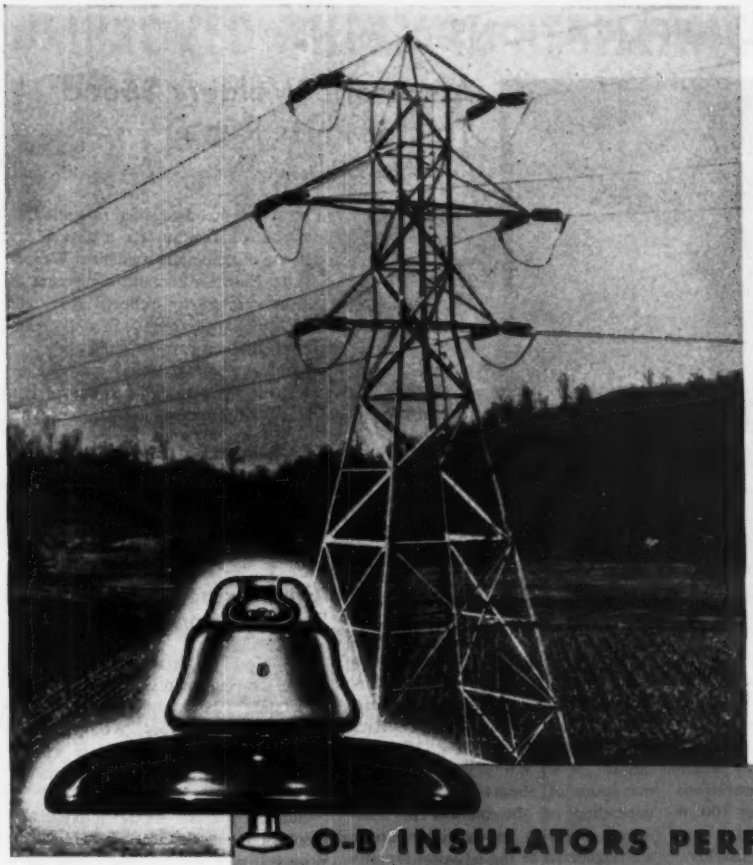
One or more tubes may be tested simultaneously depending on the number of plugs available.

Rubber plugs with a long taper should be used to insure a tight fit in the condenser tube.

This method of locating leaking tubes in steel condensers is quick and easy.



TUBE LEAK in steam condenser is indicated by collapse of latex finger cot on plug



O-B INSULATORS PERFORM FOR 26 Trouble-Free Years

From the owner's own records - and on his own terms - performance of O-B suspension insulators on this line, after 26 years of service, was branded "trouble-free." Experiences such as this account for the repeated use of O-B insulation, time after time, as power systems expand their transmission facilities. Likewise, such experiences justify making O-B *your* CHOICE OF **INSULATORS.**

Ohio Brass

MANSFIELD, OHIO

IN CANADA: CANADIAN OHIO BRASS CO., LTD., NIAGARA FALLS, ONT.

4880-M

INDUSTRIAL APPLICATIONS

Automatic Welders Speed Tractor Parts Repair

MARLEN DAVIS, Sacramento Municipal Utility District, Calif.

Time saved over previous hand-welding operation, a more uniform quality, and a harder surface if desired are benefits gained through use of automatic welders at Weaver Tractor Co, Sacramento, Calif. Automatic equipment is used in rebuilding surfaces of tractor rollers, idlers and tracks that have become worn. Thus salvage of these parts means a further saving to the company in vital steel.

There are two separate automatic units—one applies metal to round surfaces, the other to either round or flat surfaces. Each utilizes a single-phase, transformer-type welder with up to 140 amp at 240 v on the primary side and up to 625 amp on the secondary side.

CONTINUOUS TRAVEL of 4 ft is feature of this flat welder. At end of travel, welding head reverses itself and a bead is then laid parallel to former until entire surface is covered

Airport Taxiway Directional Signs

Here is a brand new potential load builder in airport lighting—the illuminated airport taxiway directional sign. These signs will be of great assistance to pilots (both day and night) in finding their way around the large terminal-type airports—especially where there are dual runways and numerous taxiways. At such fields, over 100 of these signs may be required for runway turn-offs and destination markers. These signs will also assist control tower personnel, since pilots will not require so many radio instructions from the tower.

The signs are made of sheet steel or aluminum painted yellow for maximum daytime visibility and are mounted on concrete bases. The numerals and letters have yellow plastic in back of the cut-outs outlined with a ¾ in. black stroke. Each letter or numeral has two 325 lumen (about 29 w) 6.6 amp lamps or a maximum of about 300 w per sign depending on the number of characters. Signs at runway intersections are connected to the adjacent taxiway lighting circuits. Those on taxiways are also connected on the taxiway circuits (which may be either series or multiple.) Isolating transformers are used to connect signs to the taxiway circuits.

NEW TAXIWAY SIGNS help pilots find their way around large terminal airports and reduce tower radio instructions required. Picture shows members of the IES Committee on Aviation Lighting inspecting signs being tested by CAA at Indianapolis Municipal Airport

Color-Corrected Mercury For New 1000-W Lamp

To meet the trend toward larger manufacturing spaces, higher mountings and higher lighting levels both indoors and outdoors, Westinghouse Electric Corporation has made available a new 1000-w, fluorescent mercury lamp.

Similar to the 400-w fluorescent mercury lamp, this new light source provides a golden white light intended for all types of lighting service except those where close color discrimination is involved. Its bulb has a specially developed isothermal shape that is designed to allow the phosphor coating to function at maximum efficiency.

When activated by invisible ultraviolet light from the quartz arc, the phosphor gives off red light. This blends with the blue-green-white light from the mercury arc to give a golden white light with approximately the same color quality as a mixture of equal wattages of mercury and incandescent light. Inside frosting of the bulb is said to provide better diffusion of light and greater uniformity of color.

When used outdoors, fixtures should be designed to protect the bulb from a driving rain or moisture-laden insects.

Designation—CH12

Outer bulb—7 in. dia. at center

(*Continued on page* 124)

IMPROVED THERMAL RESISTANCE WITH

VICTOR PURIFIED PORCELAIN TRANSMISSION PINTYPES!

VICTOR NO. 245 TRANSMISSION PINTYPE

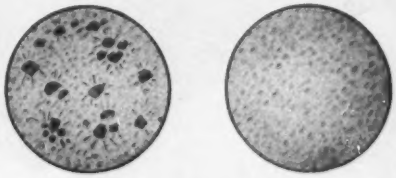
For complete engineering data on this insulator and other sizes and types, send today for Bulletin No. 4.

More Uniform Thermal Expansion Achieved

VICTOR *Purified* Porcelain has the most uniform thermal expansion ever achieved in the insulator field — expansion that remains uniform throughout its entire mass. This achievement, like *Purified* Porcelain's many other advantages, is due to the removal of all mineral salts from the water used in processing.

With VICTOR *Purified* Porcelain, failure of shells due to sudden thermal changes is eliminated. Choose VICTOR TRANSMISSION PINTYPES — made of *Purified* Porcelain — finest insulator porcelain ever made!

VICTOR INSULATORS, INC. VICTOR, N. Y.



Cross-Section of Ordinary Porcelain

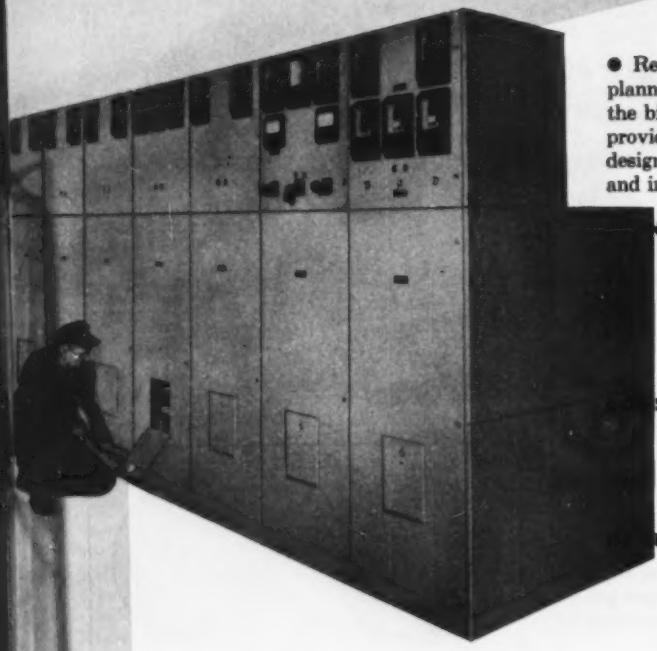
Cross-Section of Purified Porcelain

Here's Why *Purified* Porcelain Has Uniform Expansion

The drawing at the left shows a greatly enlarged section of ordinary porcelain and reveals what ceramic authorities agree contributes to porcelain weakness and possible failure under unusual service conditions. The various irregular shapes are glass-like impurities which are formed during firing, by mineral salts in the processing water. After firing, these impurities shrink at a different rate than does the porcelain itself, causing tiny fissures (shown by the dark radiating lines) which physically weaken the insulator and make it more vulnerable to puncture. Also, these differing rates of thermal expansion set up dangerous strains and stresses during sudden temperature changes in service that can actually weaken the insulator.

The drawing at the right shows the homogeneous quality of *Purified* Porcelain. Its absence of impurities gives uniform thermal expansion and lessens the possibility of failure under extreme conditions. Other advantages: maximum density and hardness, higher mechanical impact values, improved range of M and E strength values and higher oil puncture values!

I-T-E METALCLAD SWITCHGEAR



● Regardless of your engineering responsibility—planning, construction, or operation—you'll welcome the big advantages that I-T-E Metalclad Switchgear provides. Since 1937 the soundness of the I-T-E design has proved itself in central stations, steel mills, and industrial plants the world over.

NNING: Planning engineers, concerned with plant wide equipment protection problems in new and expanded distribution systems, prefer I-T-E Metalclad Switchgear because for 15 years, it has assured safe, positive arc interruption. Planning is easier because I-T-E supplies indoor and outdoor equipments in standard structures that are compact, uniform, and readily expandable.

STRUCTION: Construction engineers like the way I-T-E speeds switchgear installation. I-T-E forwards channel bases in advance, so that floors can be prepared ahead of equipment arrival. The arrangement of I-T-E Metalclad Switchgear simplifies the pulling of primary and control cable.

RATION: Operating engineers have to live with switchgear once it's in place. They like I-T-E Metalclad Switchgear because double interlocking makes it safe and easy to operate. The famous "fast-test" feature makes short work of secondary circuit testing—even eliminates opening the breaker door.

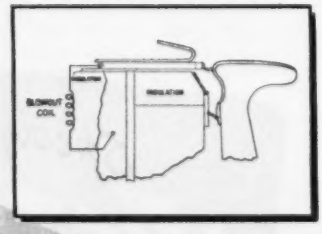
4160 VOLTS • 50,000 AND 150,000 KVA INTERRUPTING • 600, 1200, AND 2000 AMPERES CONTINUOUS

For information, including selection and application data, write for Catalog Section 7004 and Bulletin 7000-A, I-T-E Circuit Breaker Company, 19th & Hamilton Streets, Philadelphia 30, Pennsylvania.

PLANNING ENGINEERS

I-T-E Metalclad Switchgear provides safe, positive arc interruption because I-T-E Type HV circuit breakers are used throughout.

When opening short circuit current near rating, the I-T-E HV breaker interrupts the current so quickly that the moving contact travels only about one inch before the circuit is interrupted. Extra contact travel is provided for interruption of very low current.



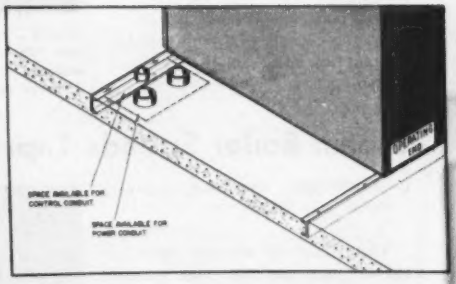
LONG-LIVED INTERRUPTING ABILITY

Arc transfer energizes blowout coil and eliminates metallic connection between front runner and lower current stud. Thus, potential is across arc chute only during arc interruption—resulting in longer chute life.

PROVES ITS ENGINEER APPEAL

CONSTRUCTION ENGINEERS

I-T-E provides switchboard floor plans, front view drawings and single line diagrams well ahead of shipment. When you're ready, I-T-E forwards channel bases—your equipment goes in right on schedule! Control and primary cables can enter structure at top or bottom. Control cable connections are located just inside the removable rear panel. You have them completely accessible for inspection and checking *without* de-energizing the circuit, *without* removing the breaker, *without* entering the switchgear structure.



OPERATING ENGINEERS

Important operating advantages of I-T-E Metalclad Switchgear save steps and guard your safety. Here are just a few of them:

1. Secondary circuit testing without removal of breakers from the stationary structure. No separate operation of secondary disconnecting devices is required.
2. The double interlock assures complete safety of personnel and equipment—guards against improper insertion or withdrawal of the circuit breakers. Interlocks are built into the circuit breaker—eliminating complicated engagement mechanisms between the breaker and structure. Adjustments are simplified and interchangeability is assured.
3. Circuit breaker control-relay is mounted on breaker truck; (when breaker comes out, relay comes out. No "climbing" into structure to inspect control-relay).
4. Truck-mounted horizontal removable elements eliminate hours of maintenance usually required for complicated elevator mechanisms.

Full operating positioning is accomplished by mechanical racking.

Specify I-T-E **METALCLAD SWITCHGEAR**

I-T-E CIRCUIT BREAKER CO. • 19th & HAMILTON STS. • PHILA. 30, PA.

R&IE Equipment Division, Greensburg, Pa. • Canadian Mfg. & Sales: Eastern Power Devices, Ltd., Toronto • Export Sales: Philips Export Corp., N.Y. 17, N.Y.

Color-Corrected Mercury

(*Continued from page* 120)

Outer bulb finish—Phosphor Coated
Inner bulb—Quartz
Base—Mogul screw
Rated initial lumens—50,000 approx.
Rated average life—4000 hr
Overall length—15⅜ in. max
Light center length—9½ in. approx.
Burning position—Any
Open circuit voltage—220
Operating voltage—135 approx.
Starting current—12 amp approx.
Operating current—8.2 amp approx.
Starting time to full output—4 min
Restarting time—6 min

COLOR CORRECTED mercury lamp at left is new 1000-w size producing 50,000 lumens, designed for industrial high bay mounting. Lamp at right is 400-w size

Steam Boiler Speeds Tape Making

L. ALBERTSON, Application Engineer, Philadelphia Electric Co

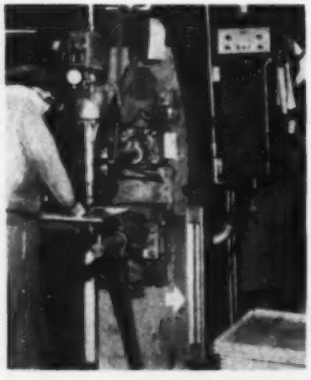
Manufacture of asbestos tapes for electric insulation has been speeded up by use of an electric steam boiler at the Wissahickon Asbestos Co, Ambler, Pa. Steam conditions the tapes and enables them to be compressed accurately into required sizes. Rough surfaces are pressed smooth.

Automatic features permit continuous operation of the boiler without attention and sealed-in heating units prevent heat from escaping and causing discomfort in working conditions. These advantages were not experienced with steam supply obtained previously using another fuel. Boiler is operated by three 2000-w heating units and produces steam at 2 to 3 lb pressure, 18 lb per hr. Steam is supplied to small reservoir through which the asbestos tapes are run to absorb moisture and heat before they enter a calender for the pressing operation.

CONTINUOUS OPERATION is permitted by use of electric steam boiler to supply steam for conditioning asbestos tapes prior to compression. Insulated heating units improve working conditions.

Comfort Heater Cuts Warm-Up

Comfort heating with electric radiant heater bolted to punch press located in open factory area at Knox Stove Works, Knoxville, Tenn., provides immediate and direct warmth to lower part of workman's body. Semi-stationary type 800-w heater is easily attached by two bolts and can be moved to new machine as production needs change. Substitution of kwhr for man hours otherwise lost in warm-up period saves more than equipment cost, helps build morale, and keeps production running smoothly.



E. L. Wiegand Co

INDUSTRIAL BRIEFS

Silver soldering of steel collars for relay can assemblies is done in 45 sec by a 5-kw, 450-cycle induction heater at the Plantsville, Conn., factory of Allied Control Co. The bond is tight and durable and rejects are now very few. This job formerly took 90 sec plus time to center and clamp the two parts by hand. The collar base sets in a jig just above the inductor coil flux. A ring of silver solder around the lower part of the top melts when the two pieces are up to heat. Connecticut Light & Power service.

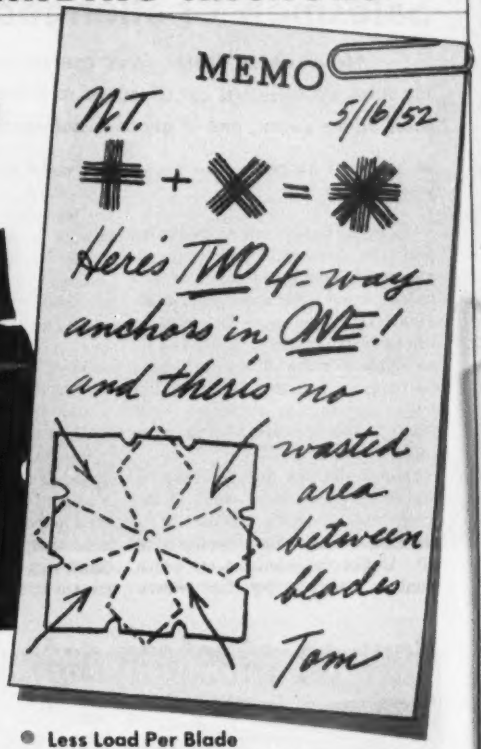
Paint drying with infrared heating has quadrupled production and saved space at Milton Marks Corp, Pittsburgh, Pa. Drying of an aluminum protective coating on display racks, small transformer cases, and metal stampings was the bottle-neck in production. Paint was formerly air-dried by hanging parts on drying racks which required considerable space and time—oftentime days, depending upon humidity. New 32-kw infrared tunnel now dries paint in approximately 8 min. G. H. McCartney, Duquesne Light Company, Pittsburgh, Pa.

Thickness control of sheet brass, copper, and commercial bronze to within .001 in. is accomplished by X-ray guage at Chase Brass & Copper Co mill, Waterbury, Conn. Mill operator watches dial and expertly corrects position of rolls when dial hand wavers from center position, thus insuring uniform thickness of product.

Airport apron lighting with fluorescent floodlights at Boston's Logan International Airport assures high level, glareless, safe and efficient operation. Maintenance loading between flights and turn-around time is speeded. High lumen output combined with low surface brightness permit low mounting heights and flat angles of projection without objectional glare. The "silhouette effect" as observed from the runway side of the apron is improved. Floodlight units are spaced 25 ft apart, bracketed to hand rail of observation deck. Each unit has two 8-ft 600-ma slimline fluorescent lamps producing over 10,000 lumens. H. N. McIntyre, Illuminating Laboratory, G. E. Co, W. Lynn, Massachusetts.

CHANCE 8-WAY EXPANDING ANCHORS

Build lines to stay with the Chance 8-Way!



No Wasted Space Between Blades

In designing the 8-Way, steel, expanding anchor, A. B. Chance Company engineers took full advantage of all the available area. There is no wasted space between blades. The load is distributed all the way around the anchor.

Expands in Cone Shape

Controlled by the bell shaped base, the eight blade, one piece top plate expands to form a cone shaped square, which distributes the anchor's holding power over a wide area, building up compression against an inverted pyramid of earth. The 8-Way retains its shape under extremely heavy loads because the base plate supports the blades in the middle and distributes the load uniformly over the blades. Reinforcing ribs provide additional strength.

Less Load Per Blade

Each of the 8-Way blades is required to carry approximately one-eighth of the total load, whereas each blade of the conventional four or two-way expanding anchor has to support from two to four times this amount. This is particularly advantageous where heavy obstructions block expansion of one or two blades. The other blades can expand to carry the load.

More Holding Power for Less

The Chance 8-Way Expanding Anchor saves you money. The simplified design cuts manufacturing costs—a saving passed along to 8-Way customers.
Compare costs per square inch area—you get more holding power for less with the Chance 8-Way Expanding Anchor.

Cat. No.	Hole Size	Area Sq. In.	Nominal Class	Rod Size (Order Separately)	Approx. Weight Per 100	No. in Bundle	Ultimate Soil-Anchor Holding Strength—Pounds 7' Depth. No Safety Factors Included.				
							*Class 3	*Class 4	*Class 5	*Class 6	*Class 7
6870	6"	70	2200, 4000 6000	½"x6' ⅝"x7' ¾" x 8'	467	5	16000	14000	11000	8300	5000
88100	8"	100	6000	⅝" x 7'	811	3	22000	18500	15000	13000	8000
88115	8"	115	8000	¾" x 8'	880	3	24500	20500	17000	14000	9000
88135	8"	135	10000, 12000		1036	3	26500	22000	18500	15000	10000
88135–1	8"	135	10000, 12000	1" x 10'	1056	3	26500	22000	18500	15000	10000
1082	10"	200	20000		1900	2	31000	26500	21000	16500	12000

* These numbers indicate types of soil: 3. Hard, dry—hardpan. 4. Crumbly, damp—usually clay predominates. 5. Firm, moist—usually clay predominates. Includes most well drained areas. 6. Plastic, wet—usually clay predominates. Includes areas only seasonally wet with slow drain as in fairly flat terrain. 7. Loose, dry—arid regions with sand or gravel predominating. Also loose wet—high in sand, gravel or loam content—absorbs excessive moisture in rainy seasons as in poorly drained areas.

CS2-12

910 NORTH ALLEN STREET, CENTRALIA, MISSOURI
815 TENNESSEE STREET, SAN FRANCISCO 7, CALIF.

A·B·CHANCE CO·

Salesmen Challenged to "Name Own Quota"

Novel water heater sales contest doubles cash awards for sales up to quota set, if quota is made. Standard pay for sales above quota, and if quota is not reached

W. SHELDON BASCOM, Union Electric Co of Missouri, St. Louis

Given the opportunity to choose his own sales quota, will the average appliance salesman take the path of least resistance and select a minimum quota calling for a minimum of effort; or will he choose a higher quota and set his sights to make it? Union Electric Co hopes to find the answer to this double question in a "Name Your Quota" electric water heater sales contest.

Despite the fact that hot water is one of the three basic needs in the home, the automatic electric water heater is not the easiest appliance to sell. Unlike the television set which numbers among its potential owners, apartment dwellers, single and double flat renters, light housekeeping roomers, and even hotel residents, the prospective purchaser of an electric water heater is largely the home owner. And although there are tens of thousands of home owners in St. Louis heating water with old fashioned side arm heaters, furnace coils and "monkey" stoves it apparently requires more effort on the part of the retail salesman to ferret them out than he is willing to devote to the task.

The average man will frequently respond to a challenge and the "Name Your Quota" contest was set up on the assumption that the average salesman is no exception. This was done in the belief that his response will be even greater if the challenge comes from within, from himself. This sales contest was designed and built around the flameless electric water heater. Here is how it works:

Double Pay for Success . . . Union Electric will pay to retail appliance salesmen a cash award for each and every electric water heater sold and installed during the two months of the contest period. Cash awards will be paid in accordance with the schedule set up in the table.

But, each retail salesman will chose his own quota of one to five sales. If he makes his quota he doubles the cash value of these sales. Thus if a salesman chose a quota of four sales and sold five heaters his cash award would be doubled for the four quota sales, but he would receive the standard $5 award for the fifth sale since he named a quota of only four, a total of $25. However, if he sold only three heaters he would have failed to make his quota and would receive the usual standard cash award of $1 for the first sale, $2 for the second, and $3 for the third sale, for a total of only $6.

In addition to the cash prize awards, every retail salesman who sells one or more heaters in this contest will be invited to a big barbecue and outing to be held at the Union Electric Club on the bluffs of the Meramec River in St. Louis County. Cash prizes will be awarded to the contest winners at the outing.

The "Name Your Quota" contest was presented at a rally attended by more than one thousand dealers, distributors, plumbers, and retail and wholesale salesmen. Two weeks before the contest began, a descriptive brochure containing complete information about the contest was mailed to approximately 1,500 dealers, distributors and plumbers. The mailing included a supply of cards to be used for reporting sales as they are made during the contest.

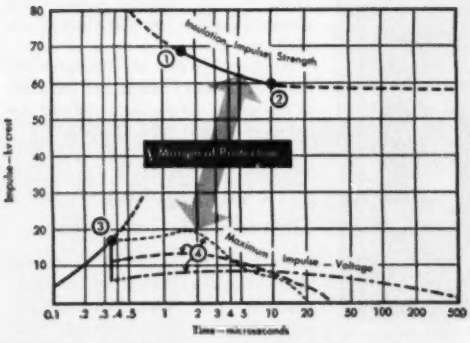
Also included in the mailing was a pocket size Electric Water Heater Sales Manual containing information about the market, some of the advantages of modern electric water heating, factors which unfavorably influence the cost of automatic water

Self Service in Electrical Supplies

Supermarket selling method makes its debut in electrical wholesaling in the recently opened new building of the General Electric Supply Corp in Pittsburgh. The whole building is a point-of-sale display of electrical goods, where contractors and dealers learn by the effect on themselves how their own customers will react to modern merchandising ideas.

G-E PELLET ARRESTERS are also unequalled in durability—they're the only distribution arresters with series gaps sealed in dry, inert nitrogen. Gap electrodes stay bright as new. The Pellets, themselves, are unaffected by service moisture.

No other distribution arrester protects so well



THIS GRAPH was made from actual volt-time and ampere-time oscillograms, and from AIEE standard test data. The demonstrated impulse strength of 2400-volt distribution transformer insulation is represented by the curve passing through: (1) the minimum impulse strength on an AIEE standard chopped wave test, and (2) the minimum impulse strength on an AIEE standard full-wave test. The impulse voltage allowed by a 3-kv General Electric Pellet Arrester is determined by (3) the impulse sparkover voltage of the arrester on the AIEE standard test wave, and (4) the IR drop across the arrester to ground with (top line) a 65,000 ampere discharge—(middle line) a 20,000 ampere discharge—and (bottom line) a 1500 ampere long duration discharge. The arrows show the unequalled margin of safety.

HERE'S THE EVIDENCE. The graph at the left, from actual volt-time and ampere-time oscillograms, shows the unequalled margin of safety that a 3-kv General Electric Pellet arrester gives a 2400-volt distribution transformer. Higher rated arresters, protecting higher-voltage transformers, similarly show this unequalled margin of protection.

HERE'S THE REASON. This extra protection results from a combination of low sparkover voltage and exceptionally low IR drop. Whether lightning currents are high or low, with durations long or short, no other distribution arrester holds voltages to such low levels.

HERE'S YOUR CUE. The Pellet is a valve-type arrester for universal use on urban, rural, or industrial systems. It is available in ratings of 1 kv to 15 kv inclusive. This arrester has been the quality-standard for over 25 years—it's your cue for maximum protection. For further information contact your G-E representative or your authorized G-E agent. *General Electric Company, Schenectady 5, N. Y.*

GENERAL ELECTRIC

Cash Prize Awards for Water Heater Sales

	Regular	If Quota Is Made
1st Sale	$1	$2
2nd "	2	4
3rd "	3	6
4th "	4	8
5th "	5	10
6th and over	5	5

heating, instructions on how to size the heater, and the story of average cost of operation for water heating service under the company's 18-hr controlled service rate.

Cash prizes will also be awarded to the wholesale salesmen who help their dealers and retail salesmen sell electric water heaters in this contest. Wholesale salesmen will receive a $1 cash award for every heater sale in excess of the first ten credited to their accounts. Wholesale salesmen receive credit for a sale only when the retail salesman inserts the name of the wholesale salesman in the space provided on the official sales report card.

Device Eases Cooking Problems for Blind

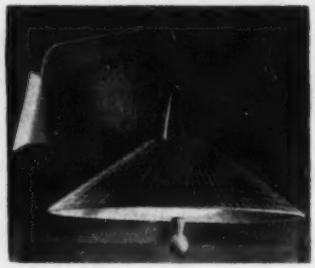
Electric cooking has been made simpler for the blind through invention of a device which tells by means of differently toned bells when the oven is "on" or "off," and when the required temperature has been reached. Perfected by G. W. Currey, a service engineer for General Electric Co, Ltd, England, the mechanism enables a blind person to merely set her Braille process times before placing food in the oven.

Also included is an indicator button on the switch panel which emerges when the oven is switched on and recedes when the oven is up to heat. Thus, if the blind housewife misses the ringing of the bells, she can check the oven temperature by feeling the indicator button. This enables the housewife to have freedom of movement.

The new mechanism was first demonstrated at a small exhibition in Edinburgh, Scotland, and last month was operated by a sightless person at a two-week Food Fair in London. GE is supplying the control unit without charge in new cookers sold to the blind.

Up and Down and Sideways

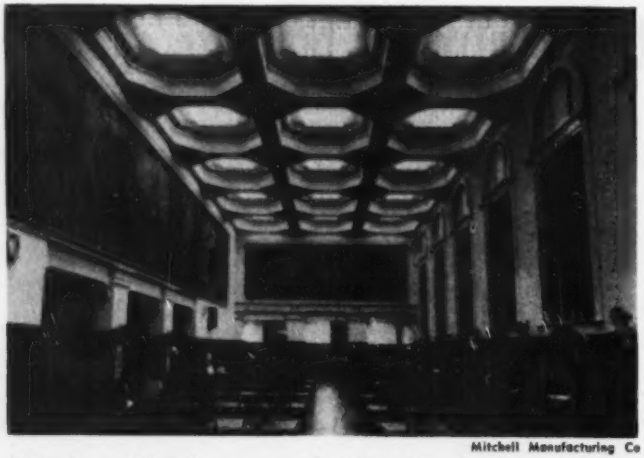
Convenient three-point adjustability characterizes this wall pin-up, one of a new line of wall and ceiling fixtures—the "Lytecaster" group—just



introduced by Lightolier, Inc. The light source pivots in its wall bracket to any position within an arc of nearly 180 degrees. It may be raised and lowered by means of a counterweight pulley, and brought out from the wall by extension of its telescoping brass stem.

The funnel shade—18 inches in diameter—is lined with off-white parchment. A highly efficient light diffuser covers the entire lower portion of the shade.

All metal parts of the lamp are brass. The wall bracket and the knob in the center of the light diffuser are made of natural finished wood.



Mitchell Manufacturing Co

Mixing Modern and Classical

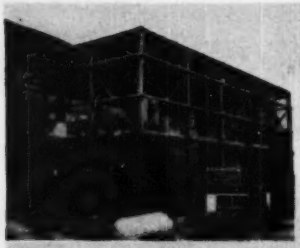
Pleasing and effective adaptation of modern lighting to a classic structure was accomplished in the reading room of the library of the Iowa State Teachers College, Cedar Falls, Iowa. Before the installation of 81 ceiling mounted units, the light intensity in the huge room measured only 8 ft-c, barely sufficient for strain-free reading. It is now 32 ft-c. Although the ceiling of the room is exceedingly high, and the fixtures are mounted in ornamental recesses, the installation provides glare free, virtually shadowless light in every section of the huge room. Another feature is that murals are completely and evenly illuminated.

Installation was done by the college's own engineering department. Used in the installation were 63 units each with four 40-w slimline lamps and 18 units with four 75-w T-12 slimlines.

Efficient Lighting Described in Booklet

To help the housewife determine the lighting requirements of her home and select the kinds of electric lights that will fill her needs most efficiently the Westinghouse Lamp Division has published a new booklet, "Better See-Ability."

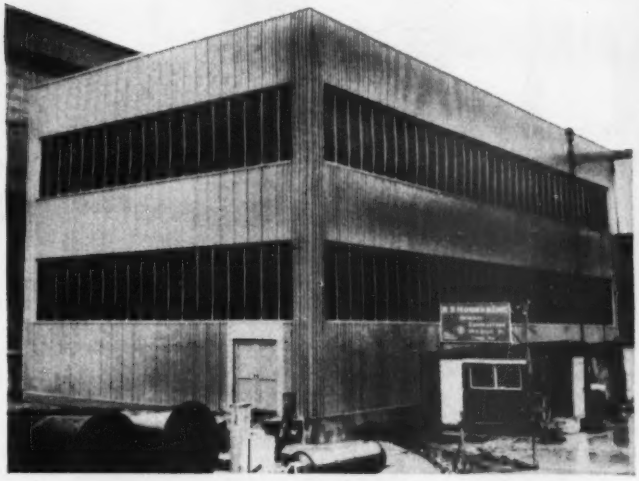
In addition to reviewing the newest designs in light bulbs, the author, Myrtle Fahsbender, Westinghouse home lighting director, details those best suited to several dozen kinds of fixtures, brackets, and table, floor, and wall lamps. Each type luminaire is illustrated with a line drawing for easy comparison with the housewife's equipment.



This addition to steam generating facilities at Olmsted Air Force Base, Middletown, Pa., is sided with panels of U·S·S 17 Stainless Steel. The building is shown above before installation of panels and at the right as it nears completion. Architect-Engineer: Gannett, Fleming, Corddry & Carpenter, Inc., Harrisburg, Pa. General contractor: R. S. Noonan, Inc., York, Pa. Stainless Steel panels fabricated and erected by H. H. Robertson Co., Pittsburgh, Pennsylvania.

Using lightweight, long-lasting, insulated building panels

Complete walls of U·S·S 17 *(Type 430)* Stainless Steel installed in 11 working days



MORE than 7,000 square feet of U·S·S 17 Stainless Steel insulated panels form the complete walls of this new building which is an addition to existing steam generating facilities at the jet engine overhaul line at Olmsted Air Force Base, Middletown, Pa.

These Stainless Steel panels were installed by a crew of eight men in only 11 working days. One group of four men removed the protective paper and drilled the panels, and a second group of four men removed the girts and bolted the panels into place.

Quick installation like this—*in any weather*—means much lower labor costs. And that's but a part of the dollars-and-cents advantage of using Stainless Steel panel construction.

In the long run, the durability and corrosion resistance of Stainless Steel walls, the light weight in comparison to conventional building materials, the low "U" value or heat transmission factor all indicate that the cost-per-year will be lower than many building materials that may have a slightly lower initial cost.

Best news of all is that U·S·S 17 Stainless Steel for walls is available *now* for use on your current projects. You can obtain it without CMP tickets for use on any authorized construction.

If you are planning a new power plant or other type of building, U·S·S 17 Stainless Steel deserves your careful consideration. If you'd like additional information, write for our book, using the coupon below. Remember, United States Steel only produces the Stainless sheet and strip from which panels of this type are made; the panels themselves are fabricated by a number of our customers whose names will be sent you on request.

The 24" wide Stainless panels backed with 1½" Fiberglas insulation and a metal-coated steel inner plate are attached to the building's structural members by four ½" x 3" round-head Stainless Steel bolts.

United States Steel Company
Room 2803J, 525 William Penn Place, Pittsburgh 30, Pa.

☐ Please send me your booklet, "U·S·S 12, U·S·S 17 Stainless Steel Walls and Roofs for Industrial Buildings."

☐ Please arrange to have fabricators of Stainless Steel wall panels send me literature on their particular type of construction.

Name ..... Title .....

Address .....

City ..... State .....

UNITED STATES STEEL COMPANY, PITTSBURGH · AMERICAN STEEL & WIRE DIVISION, CLEVELAND · COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
NATIONAL TUBE DIVISION, PITTSBURGH · TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. · UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

U·S·S STAINLESS STEEL

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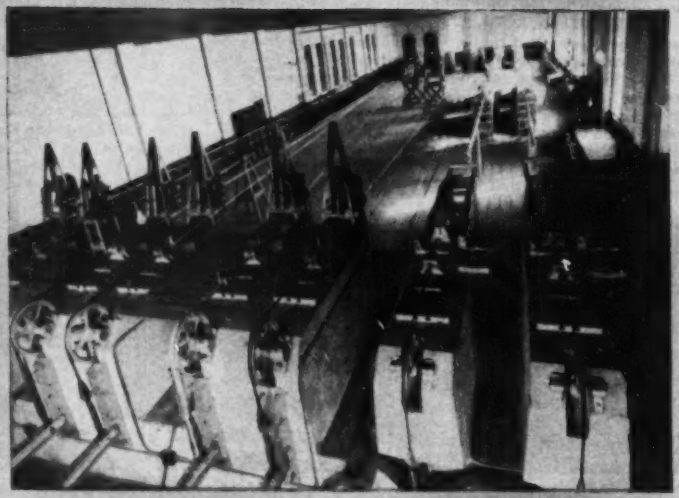
2-1258

UNITED STATES STEEL

ACSR



ALCOA

ALCOA

... and Alcoa Research

Exhaustive testing at Alcoa's laboratory in Massena, New York, helped establish basic data necessary to prevent conductor failure from vibration.

Here, vibration machines give a cable the shakes, for months and months. From research like this, Alcoa has devised ways to dampen vibration . . . to add years and years to the life of transmission line conductors.

Alcoa research continues to improve the cable you get. Cable with uniform stranding . . . steel core wire rigidly inspected to meet ASTM specifications . . . cable in uniform lengths, clearly marked on reels. Features built into the product by careful Alcoa workmanship and rigid inspection standards. Features that mean you get only quality cable at Alcoa. For more information, call the nearest Alcoa Sales Office or write:

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ALCOA TELEVISION—CBS Network, 6:30 to 7:00 P.M. EDST every Sunday on most stations—8:30 to 9:00 P.M. in far West

ALCOA ACCESSORIES

Alcoa has developed a complete line of aluminum accessories to help you build your T. & D. lines faster and better.

FIRST IN ALUMINUM FIRST IN A·C·S·R

NEW EQUIPMENT

Industrial Radio

A two-way radio, designed for industrial use, is completely self-contained, except for the speaker which may be mounted where it can be best heard. The operating controls, on the front of the cabinet, are large enough to permit adjustment while wearing gloves. One application is on lift and fork trucks.

This line includes a 10-w and a low power unit for both 6-v and 12-v operation. All models operate in the 152-174 megacycle band.

General Electric Co, Syracuse, N. Y.

Utility Truck Bodies

Two service and maintenance bodies, Series 44 and 44-L (with vertical extension) provide body compartments for storage of tools and supplies and have an overhead rack with adjustable brackets. Each body unit is constructed of electrically welded steel sections.

Designed for installation on chassis having C. A. dimensions of 40, 48 and 60 in, the body units can reportedly be transferred easily to a new chassis when the original truck wears out. Description and construction details in Bulletins 113 and 114.

McCabe-Powers Auto Body Co, 5900 North Broadway, Saint Louis 15, Mo.

Wire Terminator

This automatic machine for applying solderless terminals to wire is said to be capable of applying up to 4000 terminals per hour, depending on operator dexterity. The solderless terminals are fed in strips from a reel and the machine operated automatically or by micro-switch foot pedal.

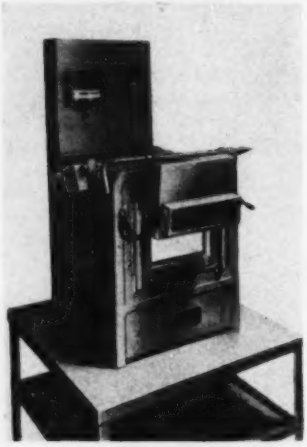
The terminating machine is 35x24 x30 in. and weighs 225 lb. It operates from 115v a.c. and may be bolted to a work bench. The machine represents no capital investment, since it is loaned to the user when the solderless terminals are ordered in specific quantities.

Aircraft-Marine Products Inc, 2100 Paxton St, Harrisburg, Pa.

Electric Furnace

A bench-type electric furnace, the VK-7, has chamber dimensions of 10x6x18 in. and can be used for heat treating to 2000 F. The heating elements, of 6.5-kw capacity at 220-v single-phase, are on all four sides of the chamber and in the door. This is said to provide even heat distribution and close temperature uniformity for more efficient control.

The furnace is provided with an integrally mounted control panel, a controlling pyrometer, and a fused line switch. The embedded design heating elements may be renewed without dismantling the furnace.



Cooley Electric Mfg Corp, 905 Daly St, Indianapolis, Ind.

High Temperature Coils

A line of fine wire coils are reported capable of continuous operation in the 450-650 F range, while occupying little more space than con-

LET'S TALK WIREHOLDERS . . .

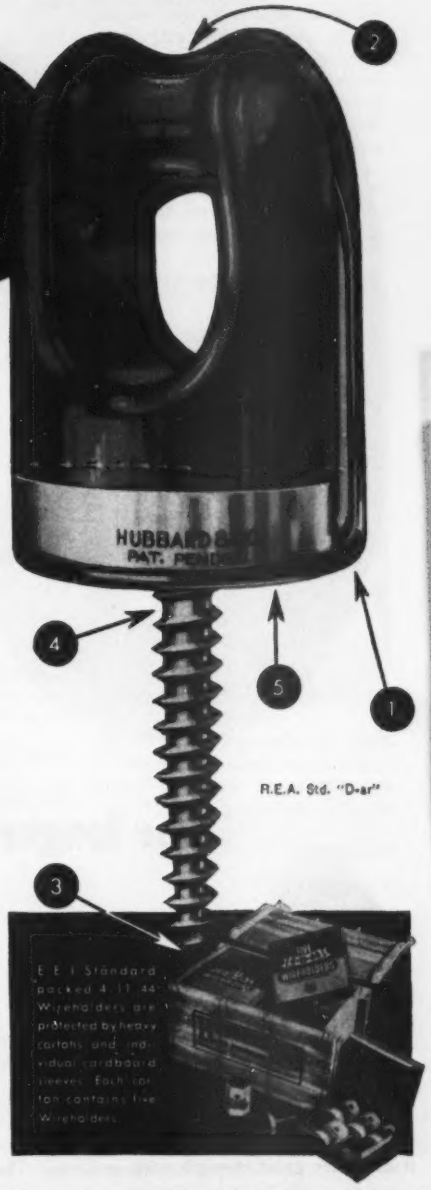
HUBBARD 4-11-44 *has what it takes*

No other wireholder combines so many desirable features as the famous HUBBARD 4-11-44 . . . advantages which have been proven in millions of installations.

HERE'S THE LIST....

1. Designed so that the heavy Copperweld bail takes all the tension . . . the porcelain is subjected to compression only.
2. The smoothly rounded surfaces avoid damage to insulation.
3. The special wood screw is sharp-pointed, easy to start by hand; the threads are sharp, deep, clean-cut, for fast insertion. No other wireholder screw on the market can match the Hubbard design for ease of installation or holding power.
4. The thread is cut clear to the base, and gives a strong grip, even in material considerably thinner than the length of the screw.
5. The heavy steel base is Hubbard double-dip hot galvanized, to effectively prevent corrosion or rust streaks; the 4-11-44 is built to resist the elements through the years. There are no closed pockets to retain moisture and dirt that cause unsightly streaks.

Exhaustive tests have proved that the Hubbard 4-11-44 has the greatest dead-end strength of any wireholder manufactured, plus sufficient strength on angular attachments to provide proper margins of safety over any load which would be encountered consistent with approved engineering practice.



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type

CB*

construction

for longer power cable life

construction (type CB) is the only *practical* method known for purifying and stabilizing the oil impregnate in power cable.

Type CB cables can be made with a resilient carbon black paper binder. This is a big improvement because it combines great strength with resiliency. The lead sheath is thereby relieved of strains due to bending and temperature rise.

And you can get CB with F-3** Arsenic-Lead Alloy Sheath. It does not age-harden and has the highest resistance to slow-bending fatigue, creep, vibration and internal pressure.

So it's Type CB with resilient binder and F-3 for power cable that lasts.

For technical details, ask your nearest Anaconda Sales Office, or write to Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y. 5245

the right cable for the job

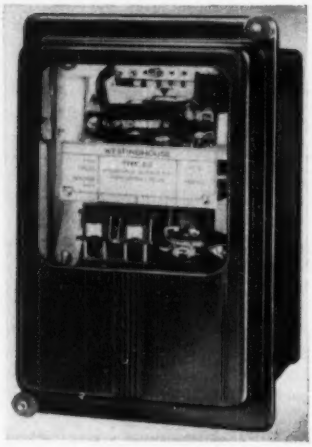
ANACONDA® **wire and cable**

*CB—Carbon Black (U. S. Patent 2,102,129) Reg. U. S. Pat. Off. **F-3—Arsenic-Lead Alloy (U. S. Patents 2,300,788, 2,375,755 and 2,504,600) Reg. U. S. Pat. Off.

ventional windings. Applications are magnets, also field coils of induction and synchronous motors.

Built to user specifications, these high-heat coils are wound with wire sizes 30 through 44, on round or rectangular bobbins, with lug terminals or flexible leads, and for ac or dc service.

Douglas-Randall Inc, 102 High St, Westerly, R. I.



New CO Relay

A slow speed overcurrent type protective relay, available in 0.5 to 2.5 amps, 2 to 6 amps, or 4 to 12 amps range, is used principally for protection of transmission and distribution lines.

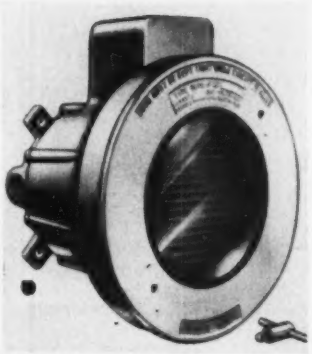
The one-piece die-cast frame and the cast alnico magnet are said to add to the reliability of the relay, which is electrically and mechanically interchangeable with the old type CO relay.

Accurate timing is provided by adjustable magnetic plugs, and the relay can be changed in the field from one time characteristic to another by simple adjustments.

Westinghouse Electric Corp, Box 2099, Pittsburgh, Pa.

Lighting Fixture

This 200-w explosion-proof lighting fixture, designed for flush mounting in ceilings, is available with an 8-in lens for symmetrical lighting distribu-

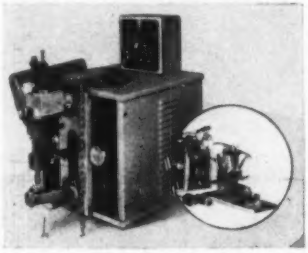


tion, or with a prismatic lens for asymmetric distribution.

The explosion-proof fixture is reported suitable for use where headroom is limited or where pendant-mounted fixtures would obstruct overhead equipments such as cranes or hoists. The prismatic lens fixture may be mounted in the ceiling so as to illuminate both control boards and panel boards.

Spot Welder

The model 5000 WVS resistance spot welder and soldering machine, 10x11x10 in, operates on 220v ac at 25 amp, and is said to weld in less than one second steel parts up to 3/16 in. thick. It also spot welds copper to bronze, copper to copper up to 0.040 in. and brass to brass up to 0.080 in.



It will solder brass up to ¼ in. thick as well as sterling silver and other precious metals.

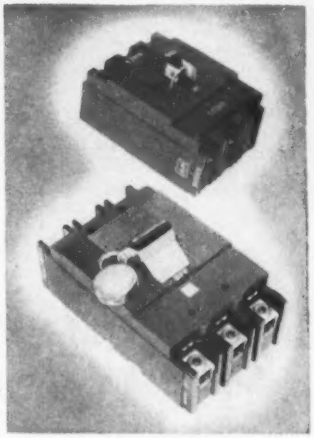
Water-cooled electrodes hold the work in position during soldering and cooling, and an automatic cut-off timer regulates the soldering time and heat to prevent work burning and shrinkage.

Joyal Products Inc, 56 Belmont Ave, Newark 3, N. J.

Circuit Breaker Locking

Handle locking attachments for circuit breakers offer additional protection for maintenance men working on feeders with breakers in "off" position. A padlock may be inserted which will prevent the removal of the safety locking devices while work is being done on the circuits involved.

The attachments also make it possible to lock the circuit breakers in the "on" position for continuous duty cir-



cuits, such as emergency service alarm systems, etc. Protection against accidentally turning off the circuit is provided without interfering with the overload mechanism.

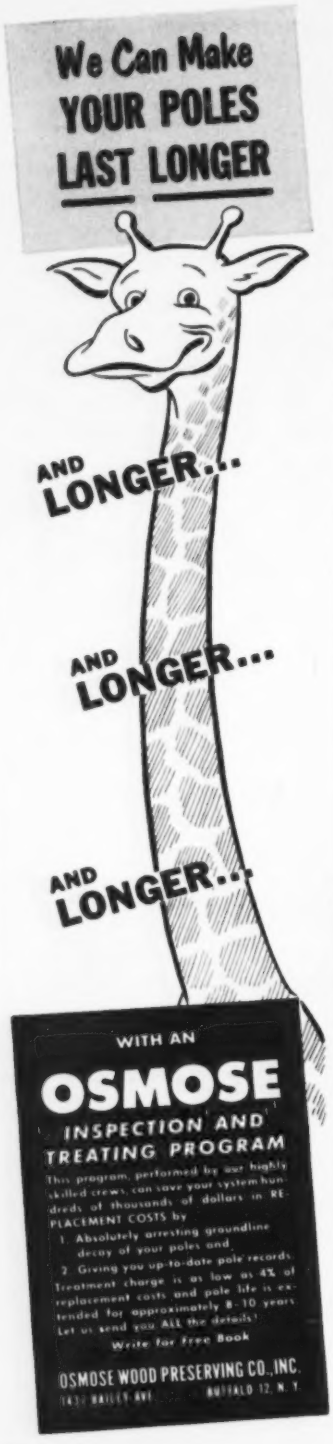
Square D Co, 6060 Rivard St, Detroit 11, Mich.

Electromagnetic Pump

An ac pump with no moving parts is designed for pumping liquid metals and other low resistance conducting fluids at temperatures up to 1,000 F. Operation is by magnetic force produced by a high current set up in the fluid.

The pump consists of a transformer unit, a cell unit which carries the fluid through the magnetic field, and a capacitor unit for power factor correction.

At 20 psi, the pump is said to move approximately 28 gal of molten metal a minute. The equipment requires 30 amp at 230 v. The transformer is 19 x 13 x 12 in., the capacitor unit is 22 x 15 x 10 in., and the cell is 1 in. standard pipe of num-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YOUR POLES
LAST LONGER
AND LONGER...
AND LONGER...
AND LONGER...
WITH AN
OSMOSE
INSPECTION AND
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This program, performed by our highly skilled crews, can save your system hundreds of thousands of dollars in REPLACEMENT COSTS by
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2. Giving you up-to-date pole records. Treatment charge is as low as 4% of replacement costs and pole life is extended for approximately 8-10 years. Let us send you ALL the details!
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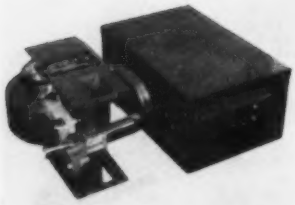


ber 347 stainless steel, 10 in. long. Further information is contained in Bulletin GEC-876.

General Electric Co, Schenectady 5, N. Y.

High-Bay Reflector Lamp

Available at ratings of 500 or 750 w the incandescent R-52 built-in reflector lamp for industrial use has a rated average life of 2000 hrs. The bulb has

a mogul base and was designed for base-up burning positions or within 25 deg of vertically base up.

Designed for high-bay lighting in factories, the lamps should be spaced no farther apart than the mounting height of the lighting units for even distribution. No special fixture is required except where needed for protection from spattering liquids.

The lamps have a C-7A filament construction with a collector grid and have a maximum overall length of 11¾ in. They operate at 115, 120 and 125 v.

Sylvania Electric Products Inc, Salem, Mass.

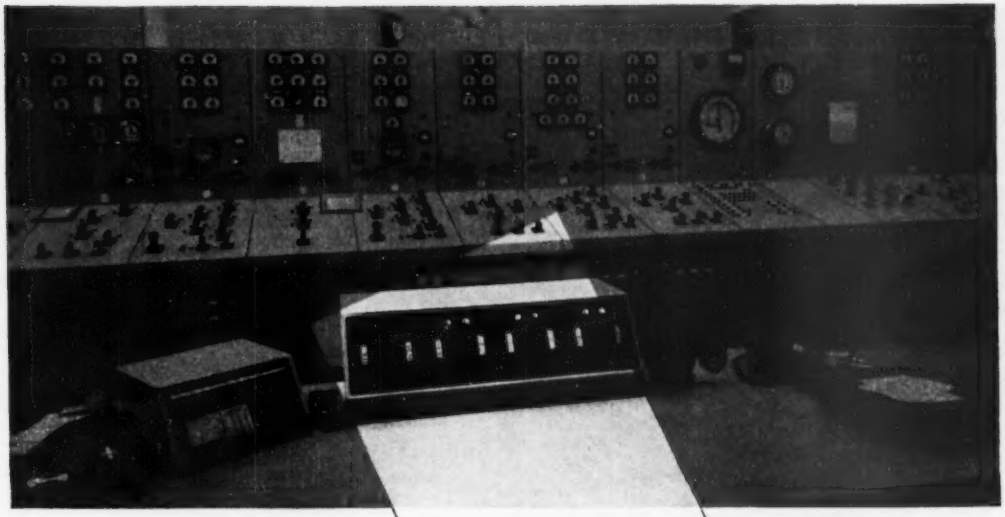
MORE NEW PRODUCTS
about which you should know

Duro-Test Corporation, North Bergen, N. J., has a 500-w and a 800-w **industrial lamp** in an R-57 bulb producing 8,000 and 14,000 beam candlepower for lighting industrial working areas where mounting height is 20, 30 or 40 ft. . . . Raytheon Mfg Co, Waltham 54, Mass, has developed a **magnetostriction oscillator** for study of effects of sound energy on liquids, living organisms and chemical reactions; available in 50 and 200w.

Automatic Temperature Control Co Inc, 5200 Pulaski Ave, Philadelphia 44, Pa, has a high gain Class A **amplifier** designed for driving servo mechanisms from small ac inputs, such as differential transformers. The company also announces three **demodulators** for transducer-servo systems, for rectifying an ac signal to a dc voltage fed to a dc meter or indicator . . . Illinois Condenser Co, 1616 N Thropp St, Chicago, Ill, designed a line of motor-starting electrolytic **capacitors** for low power factor and wide temperature range; with shockproof, corrosion-proof construction; capacities in a wide range and for voltages from 24 to 220v ac.

Eder Instrument Co, 2293 N Clybourne, Chicago, Ill, has an **industrial light** for inspection and machine work, with a range of flexible and rigid attachments. A bright beam from a miniature lamp is directed into cavities or crevices. . . . Research & Control Instruments Div, North American Philips Co Inc, 750 South Fulton St, Mount Vernon, N. Y., has designed a **Geigercounter attachment** for Weissenberg cameras, for diffraction work for crystal structure investigation.

Westinghouse Electric Corp, 401 Liberty Ave, Pittsburgh, Pa, has a **radio frequency voltmeter** that measures rms values of rf voltages in dielectric heating loads. No external power is required other than the 0.1w or less, taken from the rf source. . . . Koiled Kords, Inc, Hamden, Conn, has **retractile cords** for use with electric tools. The Neoprene-jacketed cords contain 1-6 conductors, are coiled into springlike shape that extends to six times its length and retracts when tension is lessened.



Load distribution for 8 generators

controlled from this console

With the compact console shown above, the plant operator at Detroit Edison's Trenton Channel Station has full control of loading on the station's eight generators. The eight adjustable dials on the console are remote setters for L&N Unit Load Control; they permit him to divide the total station load among the individual generators in any desired proportion. When station load changes, the variations are automatically spread out among all controlled units—each one taking its allocated percentage of the total change.

The operator can also use this control to add load to new units on the line, and to unload a unit preparatory to shut-down. Normal operating experience shows that a plant can go through a daily load cycle with all load adjustments made from this control console.

29 Generators Regulated Together

This same control is applied to all four plants of the Detroit Edison system, and will be applied to a fifth plant. Altogether, 29 generators aggregating 1700 megawatts capacity now are operating under L&N load distribution control. Because system load changes are automatically spread out among 29 units, the load variations on individual generators and boilers have been greatly smoothed out. Automatic distribution of load swings has resulted in improved stability of system frequency and interchange over tie lines connecting to the rest of the interconnection.

Little Front-of-Panel Space Needed

To add L&N Unit Load Control to present stations, the only front-of-panel space needed is that for signal lights and a selector switch for each unit controlled. All other control equipment can be located remote from the operating panel.

Our Technical Publication ND4-56-461(1) gives details on how control can simplify your station operating problem. For a copy, write to Leeds & Northrup Company, 4938 Stenton Avenue, Philadelphia 44, Pa.

LEEDS NORTHRUP

Jrl. Ad ND4-56-461(7)

for trouble-free service
specify
KNOX
preece test
puncture proof
impact strength 55 inch-lbs.
zero porosity
combined M & E 15,000 lbs.
thermal shock
KNOX High Voltage Insulators are Quality made — the Results of 30 YEARS of Experience, rigidly inspected not only to meet laboratory tests and specifications but to give trouble-free service to the users. Sell KNOX Insulators . . . . Insulators your customers prefer. Our ample stocks insure PROMPT deliveries.
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KNOXVILLE 1, TENNESSEE
WRITE FOR ILLUSTRATED CATALOG showing the complete line of KNOX insulators and electrical wiring devices

WHAT THEY'RE SAYING

At Industry Meetings

Attracting New Industry

GORDON E. GARNHART, director of real estate and insurance, Westinghouse Electric Corp, before the Texas Chamber of Commerce Managers' Assoc at Dallas, Tex.

If industry is to be attracted to new communities, Chambers of Commerce must encourage organized planning for industrial development. Specifically they should be prepared to study all potential industrial sites and make maps and photographs describing the location thoroughly.

They should conduct surveys to discover how many people would be available for industrial jobs. Trade and vocational schools should be polled to find if it is possible for them to conduct special training programs. Local tax structures should be overhauled if they tend to discourage new business.

New industrial prospects should be introduced to managers of existing local industry so there can be an even exchange of ideas, thereby aiding both parties and ultimately the community.

Grave Future Responsibilities

EARLE J. MACHOLD, president of the Niagara Mohawk Power Corp before the annual stockholders' meeting at Syracuse, N. Y.

In our uncertain times, while industry must expect to operate under an increased measure of regimentation by government and an increased tax burden, there are limits beyond which private enterprise cannot endure. We must make every sacrifice but that of the loss of our freedom. We shall lose freedom when we lose private enterprise and it will be lost if we do not limit government encroachment upon industry and the tax burden which industry must bear.

A proposal to authorize private development of additional power at Niagara is still pending before Congress and has won wide and significant acceptance and support. The New York State Federation of Labor, the State Association of Electrical Workers, the State Farm Bureau Federation, State Grange, the State Chamber of Commerce and many other local labor, civic and business groups are endorsing the proposal.

ROCKBESTOS PNR®

HELPS YOU EXTEND YOUR STEEL CONDUIT ALLOTMENT

25% MORE

Ordinary 7-conductor competitive cable, #9 AWG takes 1¼" conduit. 228 Lbs. of steel/100.'

PNR 7-conductor cable #9 AWG takes 1" conduit. 168 Lbs. of steel/100'. You save 60 lbs.

Approximately ⅓ the size of competitive control cable, Rockbestos PNR helps to provide the solution to your critical steel requirements. It enables you to use smaller conduit and fittings, thus providing substantial steel savings; or you can put 12-conductor cable in conduit carrying 6 or 7.

Here's the Rockbestos construction that makes PNR a better control cable... Polyethylene for high dielectric strength — Nylon for toughness and abrasion resistance — Rockhide for high resistance to weather, chemicals and abuse.

Get the PNR story, today. Write or ask your nearest Rockbestos representative.

ROCKBESTOS PNR®

...another different, better cable by

ROCKBESTOS PRODUCTS CORPORATION, NEW HAVEN 4, CONN.

the originators of **A.V.C.®**

New York • Cleveland • Detroit • Chicago • Pittsburgh • St. Louis
Los Angeles • Oakland, California • New Orleans • Seattle

QUICK FACTS ABOUT PNR

- 46% smaller area* . . . 28% smaller diameters*. Use smaller conduit and fittings or put more conductors in present conduit.
- Dielectric breakdown...over 40 times operating voltage.
- Lighter and smaller. Easier to handle, store, ship, pull through conduit.
- Flexible to —25°C (—13°F). No cracking!
- Rated 600 volts . . . conductor operating temperature 75°C (168°F).

*Average determined by comparison with competitive control cable.

R. S. STEVENSON

W. G. SCHOLL

R. S. Stevenson Promoted

Allis-Chalmers official is named executive vice president of the company. Willis G. Scholl gets new post

R. S. Stevenson has been elected executive vice president of Allis-Chalmers Manufacturing Co. Before he was elected to this company-wide post, he was vice president in charge of the Tractor Division.

The company also named Willis G. Scholl, formerly vice president and general sales manager of the Tractor Division, to succeed Stevenson. Scholl's successor is Frank Mussell, eastern territory manager of the Tractor Division.

Started as Salesman . . . Stevenson became associated with the firm's Tractor Division in 1933 when he joined the Kansas City branch as a salesman. Two years later he was made assistant manager of the branch at Omaha, Neb., and in 1936 was appointed assistant southwest territory manager. Later the same year he was named manager of the division's northwest territory.

In 1941 Stevenson was appointed southwest territory manager, a position he held until he was made assistant general sales manager in 1948. He was named general sales manager of the Tractor Division in 1950 and vice president in charge of that division in 1951.

Joined Firm in 1936 . . . Scholl started with Allis-Chalmers in 1936 as a salesman for the Tractor Division's branch at Columbus, Ohio. He was made assistant branch manager at Toledo in 1941 and was appointed manager in 1943. In 1947 Scholl became manager of the eastern territory, remaining in that post until his appointment early in 1951 to general sales manager of the division.

Mussell, who recently served as director of the National Production Authority's Agricultural Machinery and Implements Division, joined Allis-Chalmers' Tractor Division in 1936. After serving as sales manager in the Des Moines branch and manager of the Mason City (Iowa) branch, Mussell was appointed eastern territory manager in 1942.

•

C. A. Patton has been appointed to succeed O. G. Steele as manager of California Oregon Power Co's Yreka and Dunsmuir Divisions with headquarters at Yreka. Patton has been with Copco's North Umpqua River Division for the last five years. Steele retired recently after serving the utility for 49 years.

Duncan A. Black has been named manager of the newly combined Power Piping and Sprinkler Division of Blaw-Knox Co. Since 1949 Black has been vice president of Blaw-Knox Construction Co, a subsidiary, and assistant manager of the Power Piping Division.

Ollie T. Ayers, Jr, has been named manager of the Western Division of Florida Power & Light Co with headquarters at Sarasota. Prior to this appointment he was distribution engineer for the state-wide system. Before joining Florida P&L in 1946, Ayers served with Virginia Electric & Power Co for six years.

H. W. Balgooyen, Grant O. Hylander, K. R. MacKinnon, and **William B. Stafford** have been elected vice presidents of American & Foreign Power Co, Inc. Since 1946 Balgooyen has been secretary and assistant treasurer of Foreign Power and its service organization, Ebasco International Corp. Hylander has been vice president of Ebasco since 1949 and MacKinnon has served as president of Ebasco since 1948. Stafford will continue in his post as financial vice president.

4 Personnel Changes Announced by AEPCo

Appalachian Electric Power Co Roanoke, Va., has announced changes affecting four employees in its commercial department.

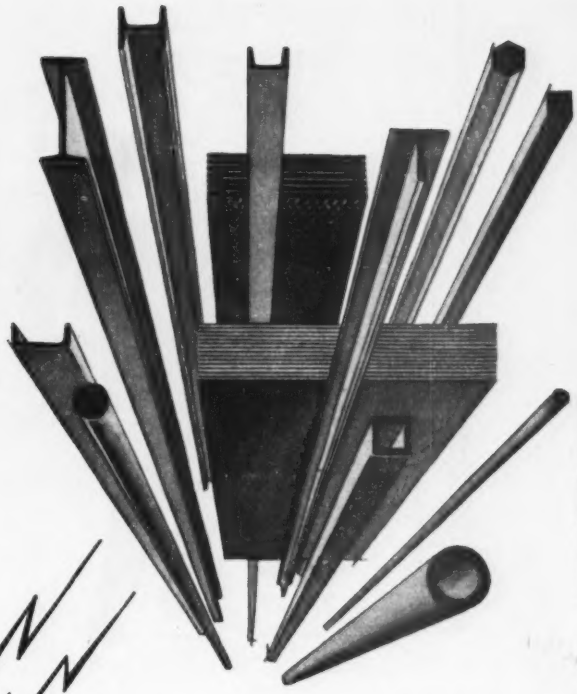
H. L. Cushing, system residential sales supervisor, has been promoted to the post of assistant commercial manager.

L. L. Koontz, system rural sales supervisor, has been advanced to the position of system rural and residential sales supervisor. B. D. Painter has been transferred from the post of Bluefield Division commercial manager to the new position of system commercial and industrial sales supervisor at Roanoke.

D. M. Miller, district commercial manager at Huntington, W. Va., has been appointed to the new post of industrial agent with offices at Roanoke.

Cushing has been associated with the American Gas & Electric System since 1925, except for a brief period during the 1940's. He started with Ohio Power Co as a salesman at Portsmouth in 1925. After two years at Portsmouth he went to Kingsport (Tenn.) Utilities, Inc, as sales manager. Then he returned a year later to Ohio Power, remaining until 1945 when he accepted a position at Dallas, Tex. Three years later he was employed by AEPCo as system residential sales supervisor. All three companies are subsidiaries of American G&E.

STEEL for UTILITIES



In stock...Prompt shipment

We carry a wide range of steel products in our 15 plants strategically located from coast to coast.

A good many kinds and sizes are in short supply at the present time, but we are still able to take care of most requirements.

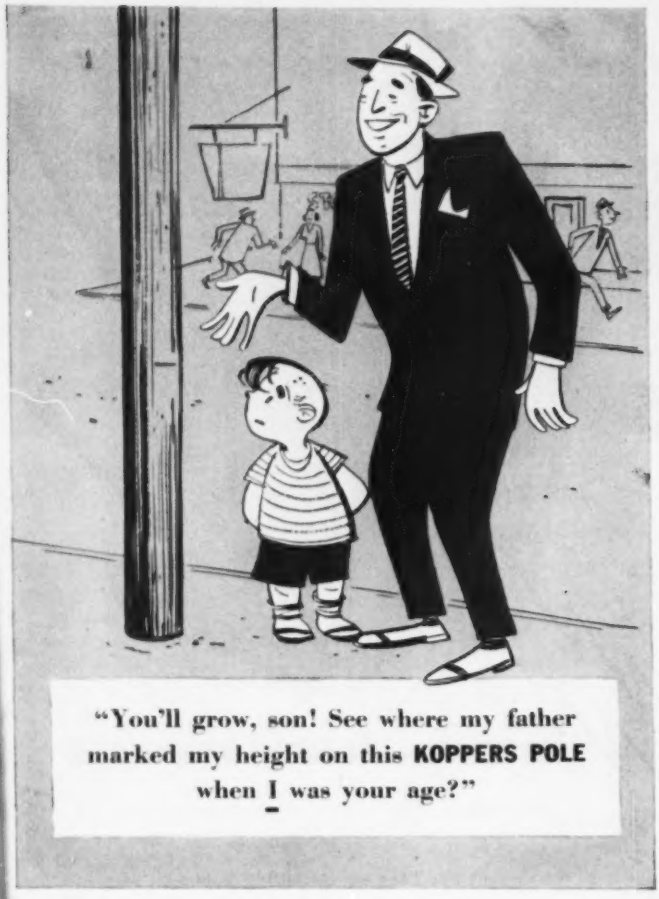
So when you have any problem of steel procurement, application, or fabrication, we will be glad to work with you.

PRINCIPAL PRODUCTS

CARBON STEEL BARS—Hot rolled & cold finished
STRUCTURALS—Channels, angles, beams, etc.
PLATES—Many types including Inland 4-Way Safety Plate
SHEETS—Hot & cold rolled, many types & coatings
TUBING—Seamless & welded, mechanical & boiler tubes
ALLOYS—Hot rolled, cold finished, heat treated
STAINLESS—Alleghany bars, plates, sheets, tubes, etc.
REINFORCING—Bars & Accessories, spirals, wire mesh
BABBITT—Five types, also Ryertex plastic bearings
MACHINERY & TOOLS—For metal fabrication

CALL RYERSON

JOSEPH T. RYERSON & SON, INC. PLANTS: NEW YORK • BOSTON • PHILADELPHIA • DETROIT • CINCINNATI • CLEVELAND
PITTSBURGH • BUFFALO • CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO • SEATTLE • SPOKANE



● Even though many Koppers Poles become landmarks, we don't recommend that they be used as measuring sticks. After all, these durable poles more than "earn their keep" in conventional ways.

Koppers Poles give utility companies long, trouble-free service—the kind of pole service that makes line operation better, easier and more economical.

Specify Koppers Full-Length Pressure-Creosoted Poles. You'll save money on maintenance *and* on replacement costs.

KOPPERS COMPANY, INC. PITTSBURGH 19, PA.

KOPPERS PRESSURE-CREOSOTED WOOD

Koontz, with AEPCo since 1930, has served as system rural sales supervisor since 1947. A veteran of 29 years of service with AEPCo, Painter joined the utility in 1923 as a junior power engineer at Bluefield. In 1947 he was named by Appalachian to the post of Bluefield Division commercial manager.

Miller was employed by the utility at Huntington in 1940. He was appointed district commercial manager there in 1949.

Four Wheel Drive Elects Robert A. Olen President

Robert A. Olen, vice president of The Four Wheel Drive Auto Co. Clintonville, Wis., has been elected president to succeed his father, Walter A. Olen. The elder Olen has been

R. A. OLEN

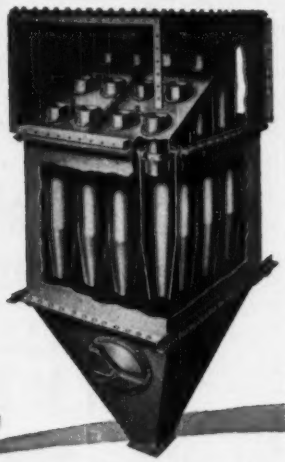
elevated to the newly created position of chairman of the board.

The new president started with FWD in 1924. After doing production equipment work, Olen became the first foreman of the company's derrick department. In 1934 he went to work in the FWD sales department and in 1938 he took charge of the firm's direct mail advertising program. Later he was promoted to the executive office, serving as secretary to the president and assistant general manager.

In 1944 the younger Olen was named general manager. He was elected a member of the board of directors in 1947 and vice president two years later.

Walter Olen has served as president of the company since it was started in 1910.

Before you buy *any* equipment for recovering dust or fly ash . . .



COMPARE ALL OTHERS against MULTICLONE'S Multiple Advantages

Because the advantages of MULTICLONE are so clear-cut, so vitally important, so far-reaching in the savings they make, we urge you to make a factual unbiased comparison of MULTICLONE dust and fly ash collection equipment against *any other* in the mechanical recovery field. Only by making such a comparison can you fully appreciate the major savings and greater performance you get by installing MULTICLONE Collectors!

COMPARE Recovery Efficiency!

It is a recognized fact that the separating efficiency of a cyclonic tube *increases* as the tube diameter *decreases* because smaller tubes generate greater centrifugal forces. The patented vane in the MULTICLONE makes the use of small tubes *practical* without complicated manifolding and permits compacting many small tubes into one simple, highly efficient unit. MULTICLONE's higher centrifugal forces throw out not only the large, medium and small particles, but also an unusually high percentage of the *extremely small* particles of 10 microns and less. Result—*more complete recovery of all suspended particles from the gas stream!*

COMPARE Space-Saving Compactness!

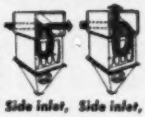
Plant space costs money—particularly at today's high construction costs. Because the MULTICLONE is more compact, size for size, it makes *really important* savings in space and plant costs. Note in the chart how the MULTICLONE requires substantially less space—*both in floor space and cubic space*—than any other unit of comparable capacity and performance. *This means vital savings in construction costs!*

Make	Relative Space Requirements In Sq. Ft.	In Cu. Ft.
Multiclone	1.0	1.0
Collector A	2.1	1.8
Collector B	5.9	3.2
Collector C	6.9	3.9

COMPARE Dollar-Saving Adaptability!

Savings in space is just one of many ways MULTICLONE reduces installation costs. Because the shape of the unit can be readily varied (long and narrow, short and wide, or square) to fit available spaces, the MULTICLONE can often be tucked into odd corners and waste areas too restricted for other equipment.

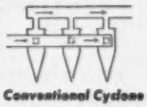
Moreover, inlet-outlet ducts can be varied—side-inlet side-outlet, or side-inlet top-outlet—to meet low headroom or restricted side clearance requirements . . . and the single-inlet single-outlet duct design permits greater flexibility and simpler installation. *These all add up to vital savings in installation costs!*



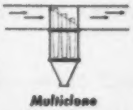
Side inlet, Side outlet *Side inlet, Top outlet*

COMPARE All-Around Simplicity!

The MULTICLONE is simple and inexpensive to maintain because there are no highspeed moving parts to repair or replace . . . no pads or filters to clean or renew . . . nothing to choke the gas flow or increase draft losses as suspended materials are recovered. In addition, the square, flat-sided shape of the MULTICLONE and its straight inlet and outlet ducts are far simpler to install and insulate. And since the recovered material from an entire bank of tubes is collected in a *single* hopper, it is much easier to service and maintain than the multiple hoppers of conventional cyclone units. *Here again, the MULTICLONE saves in many ways—all of them important!*



Conventional Cyclone



Multiclone

Whether your recovery installation is in a new structure or for modernizing present equipment, you will be far ahead by installing MULTICLONE Collectors. Our experienced engineers will gladly make helpful suggestions for simplifying your recovery problems. A letter, wire or call to our nearest office places this assistance at your service without obligation.

Send for Helpful Literature! This factual MULTICLONE literature explains the basic principles of cyclonic dust recovery and gives technical data helpful to anyone contemplating a dust or fly ash recovery installation. Write today for your free copy!

WESTERN Precipitation CORPORATION

ENGINEERS, DESIGNERS & MANUFACTURERS OF EQUIPMENT FOR COLLECTION OF SUSPENDED MATERIALS FROM GASES & LIQUIDS

Main Offices: 1011 WEST NINTH STREET, LOS ANGELES 15, CALIFORNIA

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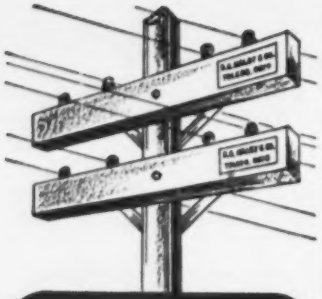

CEDAR
POLES
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FIR
CROSS ARMS
•
Latest and most modern facilities for
PENTA CHLOROPHENOL TREATING
•
LONG LIFE
CLEANLINESS
LIGHT WEIGHT
•
TWO Strategically Located Yards:
Minneapolis, Minn.
Findlay, Ohio

R. G. HALEY & CO.
SPITZER BLDG.
TOLEDO 4, OHIO

Harold Sargeant has been made manager of manufacturing for wringer washers and ironers for General Electric Co. The company also named **Elwood E. Folsom, Jr,** manager of automatic washers and dryers. Sargeant came to GE in 1920 and has been manager of manufacturing for the home laundry equipment department since 1946. Folsom, with GE since 1928, has been manager of the Trenton Works of that department since 1950.

Joseph Devine has been made application engineer in charge of Westinghouse Electric Corp's newly established office at Boise, Idaho. Devine, who joined Westinghouse in 1945, has been the firm's electric utility department application engineer at Phoenix, Ariz., since 1947.

Jay T. Sarles has been appointed comptroller of Rome Cable Corp to succeed **Stuart W. Barrett,** who has been named assistant treasurer. The company also advanced **Robert C. Graham** to chief engineer. **Frank P. Baumler** has been made general superintendent of all departments and **Austin F. Woolley** technical superintendent.

Paul L. Wright has been appointed manager of the Buffalo, N. Y., plant of Joseph T. Ryerson & Son, Inc. He succeeds **Clarence S. Gedney,** manager for the past 23 years, who has retired. Wright, who has been sales manager at Buffalo since 1951, joined the firm in 1939. Gedney started with Ryerson in 1910.

George H. Tuttle has been named director of Detroit Edison Co's Public Information Division. He replaces **E. Parish (Pat) Lovejoy,** who has been granted a year's leave of absence for health reasons. Tuttle, who has been with the utility since 1927, returned recently after a six-month assignment with Defense Electric Power Administration as a consultant in the Construction Expediting Branch.

OBITUARY

Milton J. Warner, 79, prominent in the formation and direction of many utility companies, died July 9 at New Haven, Conn. He helped establish or served the following companies in an executive or proprietary capacity: Edison Electric Illuminating Co of

HANDY ANDY SAYS,

Seal it fast ...seal it to last with

Johns-Manville
DUXSEAL

DUXSEAL is a non-hardening adhesive plastic compound made with an asbestos base. It is the ideal general utility sealing and caulking compound for sealing duct openings, potheads, bushings, terminal boxes, and for filling multi-wire contact boxes indoors. Use it like putty, just as it comes from the handy package for smooth, workmanlike jobs. Every electrician should keep a package in his tool box for on-the-spot use.

Stays plastic—Duxseal stays plastic indefinitely. Will not slump, melt or run under ordinary temperatures.

Stays tight—Clings to duct walls and cables but flexes with expansion and contraction of the cable.

Stays insoluble—Unaffected by ground waters and gases.

Stays harmless—Will not injure workmen's hands or react with rubber, metals or painted surfaces.

Tight seals for other electrical uses:

J-M Transeal . . . for use against refined oils employed in transformers, switches and similar equipment.

J-M Uniseal . . . for caulking equipment outdoors or in fume laden areas. Resists temperatures up to 180° F.

If you would like to know more about Duxseal and other J-M labor-saving sealing compounds, write Johns-Manville, Box 60, New York 16, N. Y. In Canada, write 199 Bay Street, Toronto, Canada.

Johns-Manville
SEALING COMPOUNDS

Brooklyn, Dayton (Ohio) Power & Light Co, Connecticut Railway & Lighting Co, Fulton Light Heat & Power Co of New York, Norwich (Conn.) Gas & Electric Co, and Rockville-Willimantic (Conn.) Lighting Co.

Hector J. Lemay, 58, superintendent of substation operation for Narragansett Electric Co for the past 14 years, died July 1. He had been with the utility for 39 years.

Harry E. Clifford, 86, former dean of the Harvard Graduate School of Engineering and for 21 years Gordon McKay professor of electrical engineering at Harvard, died at Newton, July 8. Earlier Clifford had taught electrical engineering at Massachusetts Institute of Technology.

Henry T. Ledbetter, 68, retired secretary of Toledo Edison Co, died at San Diego, Calif., June 28. He was secretary of Toledo Edison from 1918 to 1947.

Robert G. White, 61, former supervising engineer for Dayton Power & Light Co, died July 3 at Dayton.

Walter Edwin Mills, 75, retired electrical engineer for Puget Sound Power & Light Co, died at Seattle July 11. He joined the utility in 1916 and retired six years ago.

Daniel J. Wendt, 71, retired electrical operations manager of Long Island Lighting Co, died July 3. Wendt, who became affiliated with the utility in 1914, retired in 1943.

Frank F. Ambuhl, 66, retired assistant to the chief engineer of the Hydro-Electric Power Commission of Ontario, died June 26 at Toronto. He was a member of the American Institute of Electrical Engineers and the Canadian Electrical Association.

Harry G. Troll, 56, superintendent of overhead line construction for Louisville Gas & Electric Co, died July 4. He had worked for the company for 27 years.

August M. Kneisel, 66, former supervisor of salesmen for Toledo Edison Co, died July 8. He had served the firm 42 years, retiring six years ago.

William L. Sturdevant, 66, director of information for the Tennessee Valley Authority, died at Boston July 1. Sturdevant, a former editor of Scripps-Howard newspapers, joined TVA in July, 1933.

Before you buy anybody's MICROWAVE SYSTEM

Consider these 5 facts!

1. Who is the manufacturer?

When you specify RCA, the answer is easy. Because RCA is the world's greatest name in radio, television, and related activities. RCA has pioneered in high-frequency radio communications and really knows microwave from start to finish.

2. What has he actually done in the microwave field?

Again, RCA has rolled up an impressive record. Installed and operating are more than 19,000 channel miles of RCA microwave systems, for pipelines, power utilities, turnpikes, and government agencies. One system is over 1000 miles long, extends from New York to Washington and Pittsburgh. And after three years' continuous experience, expansion is being planned . . . proof enough of *outstanding RCA performance.*

3. Is he equipped to install microwave?

Again, with RCA, the answer is "yes." RCA will handle your installation for you . . . will even furnish you with a detailed aerial survey of the microwave route.

4. Is he equipped to maintain microwave?

Again, RCA is out in front, with a nationwide service organization geared to handle your microwave maintenance on a 24-hour basis. It's the *RCA Service Company*—already well known for its service to industry on other types of electronic equipment. It's available to you when *you* specify RCA.

5. Is the equipment designed with an eye to the future?

Yes . . . if it's RCA equipment.

For instance—consider the matter of adding additional voice and signal channels. Thanks to RCA's "eye to the future" design, you can add or drop channels at any station with a minimum of cost . . . a minimum of equipment.

Why settle for less than RCA MICROWAVE?

When you start talking about microwave, you're talking about *money.* So isn't it just good sense to be sure you invest in the best? With RCA, you're dealing with the leading name in radio . . . with men who *know* microwave. *So specify RCA—and be sure.*

You get these 7 plus features with RCA Microwave

1. Uses conventional tubes throughout.
2. Easy to tune. Has built-in metering.
3. Handles large number of single sideband frequency division channels without excessive cross-talk.
4. Flexible. Any or all voice or control channels can be picked up or dropped at any station, repeater or terminal.
5. Service channel with signaling available at each repeater and terminal station.
6. Vertical space, provides ready access both front and rear.
7. Designed, built, and backed up, by RCA . . . world leader in electronics.

RCA

RADIO CORPORATION of AMERICA

MORE INFORMATION? MAIL COUPON TODAY

RCA Communications, Dept. 45GD, Camden, N. J.

Without obligation, please send me more information on RCA Microwave for the specific application indicated:_____

Name_____

Position_____

Company_____

Address_____

City_____ State_____

☐ Please have an RCA Microwave Engineer call on me.

BEFORE TV CAMERAS Miss Betty Furness, Westinghouse television hostess during national conventions, is ready to present a commercial featuring a dessert frozen in a Westinghouse refrigerator. The TV actress demonstrated all types of home appliances in the commercials

Keeping House for TV Viewers

Two women from Westinghouse keep busy during national conventions to show how appliances lighten homemakers' tasks

Cooking and keeping house for 60 million television viewers is a job that requires plenty of stamina. Miss Betty Furness and Mrs Julia Kiene did it—aided by Westinghouse Electric Corp appliances and equipment.

The two women, one working behind the scenes and the other in front of television cameras, teamed up to show audiences what Westinghouse appliances can accomplish. They are both employed by Westinghouse, which sponsored CBS coverage of the Democratic Convention in Chicago last week and Republican Convention two weeks before.

Busy Housekeeper . . . Miss Furness, TV hostess for Westinghouse, worked before the public eye in her TV apartment consisting of a kitchen, laundry, and living room. She served homemade ice cream from the refrigerator, did the "family" laundry in an automatic washing machine, and vacuumed the living room rug, among other things, to show convention viewers the best points of her sponsor's products.

In an off-stage kitchen, Mrs Kiene, director of the Westinghouse Home Economics Institute, prepared the tempting dishes Miss Furness displayed in the TV commercials.

Short-Order Cook . . . The most demanding part of the job was having to perform on a moment's notice. The television commercials went on the air only during pauses in the convention's proceedings. This meant Miss Furness had to stand by constantly for her cue to go on. It also meant Mrs Kiene had to be prepared to whip up the food necessary for each commercial in a very short time. At one point the timing was off, and she cooked up a veritable fish-fry before the cue came to go on with two half-done fish in a pan. Helping her to do the job was Miss Marguerite Gustafson of the company's home economics staff in Chicago.

BEHIND THE SCENES Mrs Julia Kiene, right, works with Miss Marguerite Gustafson to prepare dishes for use during commercials

It didn't take the television technicians, policemen, and newsmen at the convention long to discover Mrs Kiene's talent as a cook. They soon beat a path to her kitchen door for a tasty handout. Hot coffee or ice cold fruit juices were served to all comers. Substantial lunches and suppers, were whipped up for staff members unable to leave the studios at mealtime.

Hotpoint, Inc, to Retool Its Cicero Defense Plant

This fall Hotpoint, Inc, will begin retooling its Cicero (Ill.) defense factory for production of refrigerators with pilot runs scheduled for June, 1953.

The plant contains approximately 1 million sq ft of manufacturing space and is currently producing jet engine components for the Navy. Although the bulk of the manufacturing space will be made available for refrigerator output, Hotpoint will continue to manufacture jet components permanently in this factory.

Meanwhile, plans to erect a refrigerator factory at a 400-acre site on the southwest outskirts of Cicero will be shelved temporarily. The property, however, will be retained for possible future industrial expansion.

The decision to retool the Cicero facility for refrigerator production was reached after a careful study of the needs of the national defense program. Originally designed for refrigerator output, this plant was altered before its completion to supply components for jet engines. The government's recent rescheduling of defense contracts resulted in a reduction of total quantities of jet engines needed by the Navy.

Bore Holes Faster, Cheaper

than any Machine on the American Market with

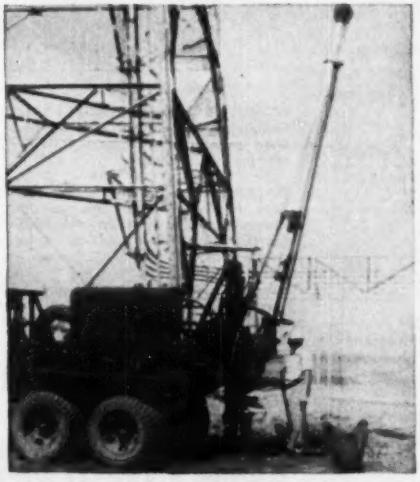
Jaques

EARTH-BORING MACHINES!

The Jaques Earth-Boring Machines are the result of over 29 years of painstaking research, pioneering and experience in building earth augers. Ruggedly built of standard, easily replaceable parts, the Jaques Earth-Boring Machine will dig holes faster, cheaper, in any kind of soil, than any other machine on the American market!

The Jaques Earth Auger is nationally and internationally known by hundreds of users such as telephone companies, state hiway departments, utility companies, oil companies, R. E. A. Cooperatives, general contractors, the United States Government, the Commonwealth of Canada, Australia, France, and other foreign countries.

The Jaques Earth Augers are improved 1953 models. The only earth augers built with fully finger-tip hydraulic controls. Our hydraulic system in and out of the hole is so designed that the operator can apply any amount of pressure in digging according to the type of soil whether rock, shale, sand stone, gumbo, clay or gravel. Augers are skid-mounted with option of turn tables or wiggle tails if desired. Economical operation and upkeep. Available in the two models shown here.



Model K-337

Built for rugged, heavy-duty boring, the Jaques Model K-337 shown above is equipped with a HEAVY DUTY Ford Industrial power unit. It includes an hydraulic pole setter and is skid-mounted on a swing table with 65 degree maneuverability which enables the operator to spot holes without moving truck. Digs holes 15 feet deep with a 9 to 72-inch diameter. (Available to dig holes up to 30 ft. at additional cost.)

The New Jaques Model KJ-254

Our new 1953 model which is our standard unit. Bores standard 10-ft. holes, 9 to 48 inches in diameter. Built to go depths up to 30 ft. at additional cost. Built for the low price of

$4550. f.o.b.
Denison, Texas

90-DAY GUARANTEE

Patents applied for on these machines.

"When Better Earth Boring Machines Are Built, Jaques Will Build Them" Write:

THE JAQUES EARTH AUGER CO. BOX 298 DENISON, TEXAS

FIND POWER LINE RADIO NOISE SOURCES QUICKLY

with the

SPRAGUE INTERFERENCE LOCATOR

- The ideal, portable instrument for fast, easy location of radio noise sources on power lines and electrical equipment.
- Compact, rugged, easy to operate.
- Utilizes 8-tube superheterodyne circuit. Frequency range from 550 kc to 50 mc.
- Operates from self-contained dry batteries, automobile battery, or 115 volt mains.
- Features include loop and collapsible rod antennas, built-in loudspeaker, built-in dual range output and battery test meter, calibrated r-f and audio gain controls, and beat frequency oscillator.

Write for Bulletin PF-601

SPRAGUE ELECTRIC COMPANY
North Adams, Mass.

A new defense factory built by Hotpoint at Milwaukee will continue to manufacture turbo-superchargers for the Air Force under a contract that runs into 1954. Civilian operations at Milwaukee include manufacture of automatic dishwashers, electric water heaters, and food disposals.

NaReL Insulation Made by Naval Research Lab

A synthetic product having a dielectric strength higher than glass has been developed at the Naval Research Laboratory, Bethesda, Md. Known as NaReL, the product is potentially valuable for electrical insulation. It is made by forming commercially available silicon fibers into sheets.

This new material, according to the chemists, combines the appearance of tissue-thin paper with the draping qualities of cloth, and yet does not use either paper making or textile-carding techniques. Furthermore, it will withstand an operating temperature of 250 F, which exceeds the temperature requirements for Class H insulation.

The process calls for basic resins to be heated, combined with air and thin sprayed onto a fine metal screen from which the resultant non-woven fabric can be removed. Since the process requires neither critical paper-making nor textile machinery, the product should be a comparatively inexpensive material with application as a long-lasting insulation for electrical apparatus.

In addition, the product is also water repellent, which suggests potential applications for protective clothing.

SALES ASSIGNMENTS

COMPANY STAFFS

Elliott Co, Jeannette, Pa., has appointed George J. Greaney, Jr, manager of its new Corpus Christi (Tex.) branch office, located at 731 Wilson Building.

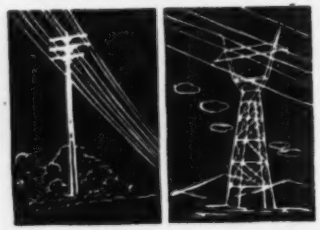
Electric Controller & Manufacturing Co, Cleveland, has made J. P. Moore district manager of its Cleveland sales office. Moore started with EC&M in 1923 in its home sales office.

REPRESENTATIVES

Edward Valves, Inc, East Chicago, Ind., has appointed Reed & King, Inc, as its sales representative for Minnesota, North Dakota, South Dakota, and northwestern Wisconsin. Offices of Reed & King are

ELIMINATE RE-TIGHTENING OF NUTS

On Steel Tower and Wood Pole Lines



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SEND details of your needs for samples. Write for PALNUT literature and detailed folder on power line applications.

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located in Foshay Tower, Minneapolis, Minn.

R. Thomas & Sons Co, Libson, Ohio, has appointed the Williamson Sales Co as a sales and service representative. With offices in Shreveport and New Orleans, La., Amarillo, Dallas, Houston, Tex., and Pine Bluff, Ark., Williamson Sales will handle the complete Thomas line, which includes all types of porcelain insulators.

Recloser Maintenance

(*Continued from page* 91)

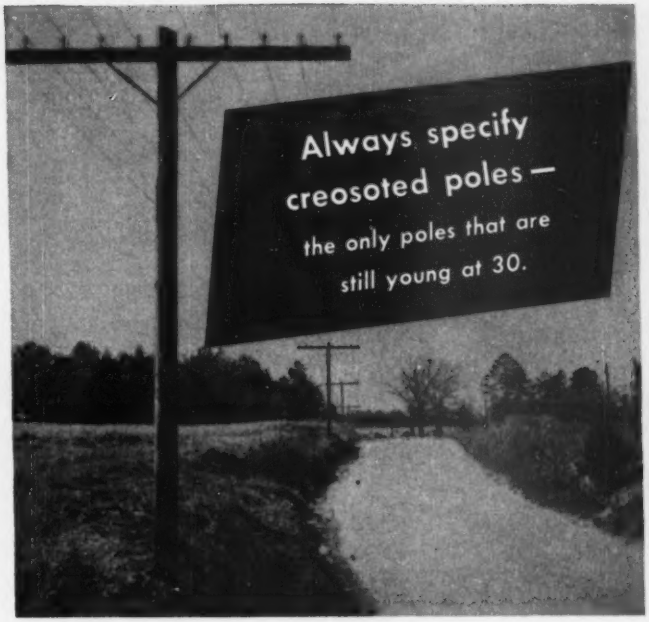
be serviced, a random number of units are taken down from time to time and inspected. The condition of these units serves as a guidepost for general servicing of all units. This method, however, does not afford a close check on units which have severe interrupting duty. In addition, the overall cost of such a practice is probably higher than for the previously recommended program.

Maintenance Costs . . . Whether the equipment should be serviced in the field or brought into a shop is a matter for each user to decide. Field service for reclosers and sectionalizers is a very simple operation. When a general check is needed, a truck can be equipped with a barrel of oil, tank liners, contacts, and a few spare parts. The recloser or sectionalizer is lowered from the pole, the oil changed, parts inspected and cleaned, contacts filed (on those makes of equipment which require it), and the unit placed back in service. The entire process is only a matter of minutes.

One large power company ran a study on this maintenance procedure in 1948. For its distribution system they found that four men took an average of 46.3 min (including traveling time) per breaker. Inspection and maintenance at a "central point"—probably one of its shops—took approximately 15 min.

The cost of field service by this utility was estimated at less than $6 per breaker. This figure could be reduced, it was stated, if the truck were equipped with a few simple conveniences for handling the equipment. No actual values were given for expense if the units were taken to a shop. However, the amount should not be very much different from the one given for field service.

Although the cost of maintenance has undoubtedly gone up since that time, it should still be less than $10.



● Far too many poles are ready for the scrap pile long before they've been in service for 30 years. However, if your poles are pressure-treated with creosote, you *know* they are capable of 30 or more years of dependable service—countless service records prove it.

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Wickwire Spencer Steel Division, Palmer, Massachusetts

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BRANCHES IN ALL KEY CITIES

New Electrical Construction

New electrical construction projects announced by private and government utility systems involving more than $70,000. Also listed are major industrial and construction jobs where electrical work is included.

UTILITIES

Proposed Construction

Calif., Burbank—City, City Hall, power plant bldg. for Unit 4. $150,000. Plans deposit $25.

Colorado—Southeast Colorado Power Assoc., LaJunta, 973 mi. rural distr. lines, 67 mi. 69Kv transmission line and sys. imprvs., Prowers Co. $2,275,000.

Conn., East Hartford—Pratt & Whitney Div. United Aircraft Corp., 400 Main St., Hartford, plans by Albert Kahn Associated Architects & Engineers, Inc., New Center Bldg., Detroit, Mich., Andrew Willgoos Turbine Laboratory addn., jet engine facilities, 3 new high altitude test cells. Over $2,000,000. McConalty-Hoffman & Assoc., 150 Broadway, New York, N. Y., consult. engrs. for special equip.

Iowa—Southeast Iowa Co-operative Electric Assn., Warner A. Russell, mgr., Mount Pleasant, 35 mi. rural distr. lines, 45 mi. tie lines; 28 mi., 69 Kv transmission lines and other sys. imprvs., Proj. Iowa 69M Henry. $628,000. Stanley Eng. Co., Hershey Bldg., Muscatine, consult. engr.

Mass., Falmouth—U. S. Engr., 857 Commonwealth Ave., Boston, roads parking utilities, power lines, hydrant refueling, $1,000,000; heating plant, auxiliary power, $500,000; mogas storage, gas station, pumps, maintenance shops, warehouse, $500,000, Gilbert Small & Co., Inc., 10 State St., Boston, consult engr. railroad spur, railroad trestle, $100,000; family housing admin. bldg., clothing issue, commissary, cold storage, $100,000; BOQ officer's mess, $60,000, Otis Air Force Base.

Missouri—Barton County Electric Cooperative, Lamar, 36 mi. rural distr. lines, sys. imprvs., Barton Co. $287,000.

Montana—Bureau Reclamation, Dpt. Interior, Canyon Ferry, completing Canyon Ferry Dam, power plant, and switchyard 16 mi. northeast of Helena, Spec. DC 3752.

Nebraska—K. B. R. Electric Membership Corp., Bassett, rural distr. lines and misc. extens. and imprvs., Rock Co. $1,330,000. Raymond H. Reed & Co., Columbus, consult. engrs.

New Jersey—Sussex Rural Electric Cooperative, Sussex, 6 mi. rural distr. line and sys. imprvs., Sussex Co. $120,000.

N. M., Gallup—City, City Hall, power plant and electrical distr. sys. expansion $800,000. Rocky Mountain Engineering Co., 325 Wilda Bldg., Denver, Colo., consult. engr.

Ohio—Lorain-Medina Rural Electric Cooperative, Wellington, 25 mi. rural distr. line, headquarters facilities and sys. imprvs., Lorain Co. $205,000.

Pa., Irwin—Westinghouse Electric Corp., Union Bank Bldg., Pittsburgh, 2 story, 100x200 ft. brick, block, steel frame mica mfg. bldg. $500,000.

South Dakota—Lincoln-Union Electric Co., Alcester, sys. imprvs. and completion of previously approved constr., Lincoln Co. $230,000.

Tex., Dallas—Dallas Power & Light Co., Dallas Power & Light Bldg., new power line connections, $300,000; addnl. line transformers and regulators, $450,000.

Tex., Hondo—Medina Electric Co-operative, Hondo, 12,500 kw. electric generating plant, near here. $3,000,000. REA allot.

Washington—Bureau Reclamation, Dpt. Interior, Ephrata, 13.2 kv transmission lines, Ringold and Babcock, L. N. McClellan, Bldg. 1A, Denver Federal Center, Denver, Colo., ch. engr.

Wash., Electron—Pudget Sound Power & Light Co., Stuart Bldg., Seattle, Zone 1, White River power plant addn. $9,000,000.

Wash., Concrete—Pudget Sound Power & Light Co., Stuart Bldg., Seattle, Zone 1, enlarging Baker River power plant, near here. $9,000,000.

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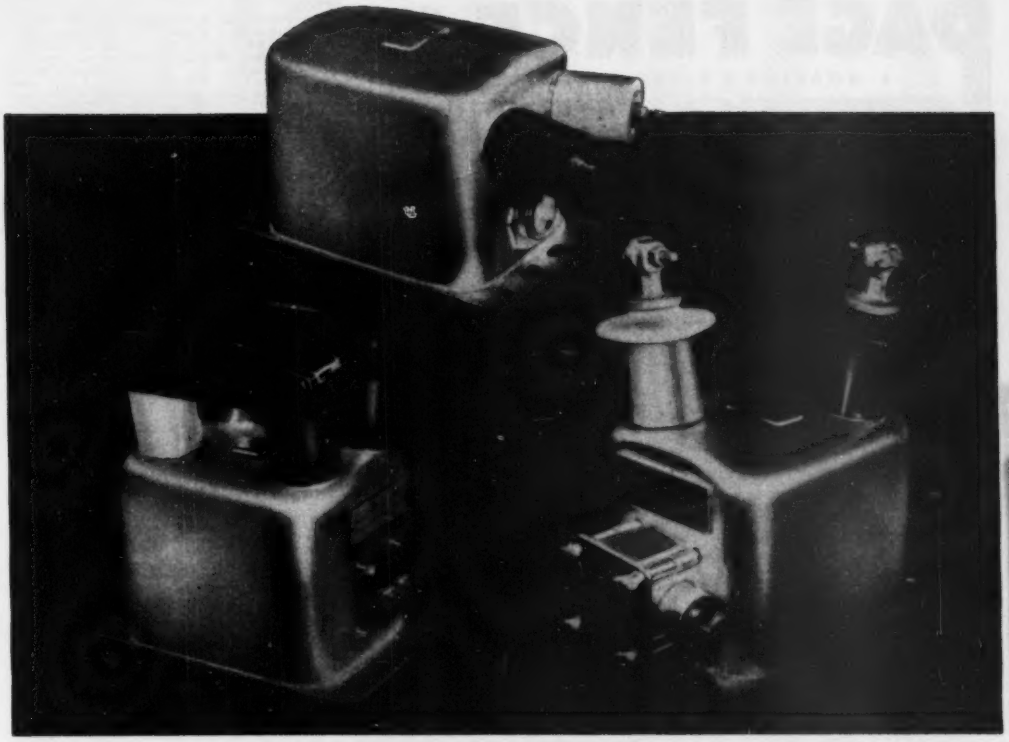

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Wisconsin—Eau Claire Electric Co-operative, Eau Claire, 25 mi. rural distr. lines, sys. imprvs., Eau Claire Co. $180,000.

Alaska—Bureau Reclamation, Dpt. Interior, Bldg. 53, Denver Federal Center, Denver, Colo., furnishing, del. f. o. b. cars shipping point or f. o. b. cars Anchorage, three 34,500-volt-insulated, 20,125-67.08/-115 volt, 60-cycle, oil filled, base-mounted, outdoor potential transformers, for wye connection on a 34,500-volt sys.; six 34,-500-volt insulated, 34,500-to-115-volt, 60-cycle, oil filled, base mounted, outdoor potential transformers, for line-to-line connection on a 34,500-volt system; two 34,500-volt-insulated, 100/200-to 5-ampere, 60-cycle, oil filled, base-mounted, wound-type, outdoor current transformers; two 34,500-volt-insulated, 200/400-to 5-ampere, 60-cycle, oil-filled, base mounted, wound-type, outdoor current transformers; and two 34,500-volt-insulated, 400/800 to 5-ampere, 60 cycle, oil-filled, base-mounted, wound-type outdoor current transformer for Anchorage Substation, Eklutna Proj., Inv. No. D8-3750.

Alaska—U. S. Eng., 3012 Arcade Bldg., Seattle 1, Wash., steel frame power plant extens. on rein.-con. fdn. with 6 boilers and 4 generators, 22x61 ft. steel, frame, masonry warm storage bldg., ENG 95-507-52-6, Ladd Air Force Base. Plans deposit $50.

Low Bidders & Contracts Awarded

Kentucky — General Electric Corp., Starks Bldg., Louisville, Ky. CA $1,250,-000. Equipment incl. switchgear and substation for Beargrass Creek Pumping Plant. U. S. Eng., 830 W. Broadway, Louisville 3, Ky. Bids June 24, awarded June 30.

N. Y., New York—Almirall & Co., Inc., 53 Park Pl., New York 7, N. Y. CA, $2,936,180. Contr. P-79, piping and misc. equip. for 74th St. Power Plant. Bd. Transportation, 370 Jay St., Brooklyn 1, N. Y. Bids Nov. 21.

N. C., Fort Bragg—Bryant Electric Co., High Point, N. C. CA, $74,507, reconditioning 12 kv electric sys. Inv. 52-34. U. S. Eng., 308 Customhouse, Wilmington, N. C. Public Buildings.

Pa., Phila.—Hughes-Foulkrod Co., 1505 Race St., Phila., Pa., CA $90,000. Boiler, power house alterations, addns., Gulf Oil Co., 30 St. and Penrose Ave., Phila., Pa., R. C. Roether, c/o owner, ch. engr.

South Carolina—Service Electric Co., 608 Holtzclaw Ave., Chattanooga, Tenn., LB, $705,025, Pine wood Sub-station; **Roy Richards, Carrollton**, Ga., LB, $343,-535, Batesburg Sub-station;

Sumter Builders, Sumter, S. C., LB, $143,658, Camden Sub-station; LB, $146,-724, Darlington Sub-station. Central Electric Co-operative, 29 Cornell Arms Bldg., Columbia, S. C. Bids July 8.

South Dakota—General Electric Co., River Rd., Schenectady, N. Y. LB $3,230,-136, generators for Gavins Point Reservoir Proj. Inv. 52-131. U. S. Eng., 1709 Jackson St., Omaha, Neb. Bids July 9.

Tex., Dallas—Dallas Power & Light Co., Dallas Power & Light Bldg., Dallas, Tex., Purchase and Hire, $125,000, installation of meters; $75,000, new power line, street lighting from plant, Northside.

Washington—Allis-Chalmers Mfg. Co., 1126 S. 70 St., Milwaukee, Wis., LB, $437,720, ten 100,000 hp. hydraulic turbines for Chief Joseph Dam, Bridgeport, Inv. 52-53. U. S. Eng., 4735 E. Marginal Way, Seattle, 4, Wash. Bids July 2.

Sask, Saskatoon—H. J. Tubby & Son Ltd., 146 22 St. W., Saskatoon, Sask. CA $185,000. Power plant addn. Saskatchewan Power Corp., Regina, Sask.

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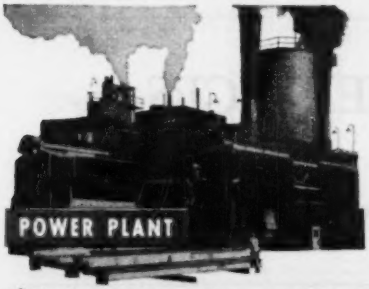
Calif., Palo Alto—Stanford University, Palo Alto, plans by Welton Beckett & Assoc., 3455 19th Ave., San Francisco, shopping center on 60-acre university property on El Camino Real between Palo Alto Hospital and San Francisco Creek. $7,000,000.

Ga., Columbus—Sunshine Biscuits, Inc., Thomson Ave., Long Island City, N. Y., plant. $5,000,000.

N. Y., Long Island City—Bd. Educ., 49 Flatbush Ave. exten., Brooklyn, Zone 1, Proj. E-324, High School of Aviation Trades, 35 St. and Queens Blvd. $6,250,-000.



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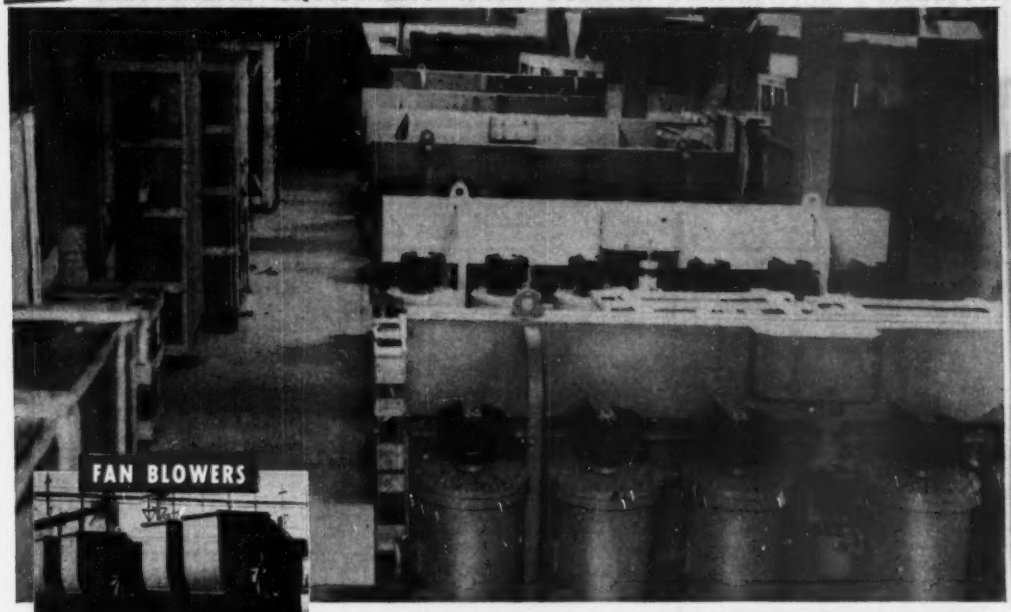

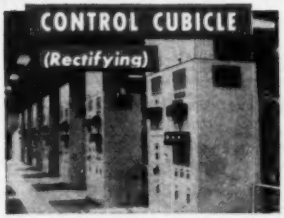

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EXPERIENCED METER ENGINEER

POSITION

Assistant Meter and Test Superintendent with administrative responsibility for operation of centralized Meter Shop and for laboratory and field testing work.

LOCATION

Eastern Utility.

ADVANCEMENT

Excellent prospects in one of the most rapidly growing areas in the country.

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15 years minimum with at least 5 years in administrative capacity in meter testing work. Meter manufacturing experience will be considered.

EDUCATION

B.S. degree in Electrical Engineering from an accredited engineering college.

AGE

35–45 years.

SALARY

Commensurate with qualifications.

Write, giving full particulars of education, experience and salary to:

P-4219, Electrical World
330 W. 42 St., New York 36, N. Y.

RATE ENGINEER

New York consulting firm seeks services of thoroughly qualified rate engineer who has had several years responsible experience with an electric and/or gas operating utility. In reply please give detailed resume of experience, education, personal information, salary expected, etc. Replies will be held confidential.

P-4836, Electrical World
330 W. 42 St., New York 36, N. Y.

REPLIES (Box No.): Address to office nearest you
NEW YORK: 330 W. 42nd St. (36)
CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)

POSITION VACANT

SYSTEM PLANNING Engineers. Graduate electrical engineers wanted to assist in planning the electrical development of a large metropolitan electric utility in northeastern part of the United States. Work consists of determining the location, size, and method of connections for additional generating capacity, and associated transmission lines and switching; distribution lines and associated substations. This work involves many electrical calculations to determine load distribution, short circuit current, stability, voltage regulation, and involves the use of AC and DC Calculating Boards. Applicants to be not over 30 years old, with BS in EE from an accredited college or university. Salary range $3600 to $5200, depending upon experience and education. Experience record, education, salary expected, and recent photograph should be submitted with the letter of application. P-4301, Electrical World.

SELLING OPPORTUNITY OFFERED

SALES, AGE 25-35, some technical background desirable contacting utilities industry, long-established specialized firm Chicago Branch. State age, education, experience, references, salary. SW-4437, Electrical World.

EMPLOYMENT SERVICE

SALARIED PERSONNEL, $2,000-$25,000. This confidential service established 1920, is geared to needs of high grade men who seek a change of connection under conditions assuring, if employed, full protection to present position. Send name and address only for details. Personal consultation invited. Jira Thayer Jennings, Dept. L, 241 Orange St., New Haven, Conn.

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STEAM PLANT Engineer—Now in charge of modern high pressure station. Mechanical Engineering graduate with broad experience in utility plant operation and maintenance. Available for change. PW-4855, Electrical World.

SYSTEM OPERATOR. Practical exp. 154KV, 10 yrs. Present salary $5000. Age 46. Go anywhere. PW-4825, Electrical World.

SELLING OPPORTUNITY WANTED

A LONDON Company desires Sole Representation of Maker of electric cable making plant or machinery and electrical products that may be imported into Great Britain. Write Hogan & Wardrop Ltd., 47/49, Caledonian Road, Kings Cross, London, N. 1., England.

U. S. Government

DEPARTMENT OF THE INTERIOR, Bureau of Reclamation. Sealed bids (Invitation No. DS-3746) will be received at Denver, Colorado, until August 7, 1952, for furnishing a main control board and a graphic and auxiliary control board for Folsom Power Plant, Central Valley Project, California. Delivery is desired within 550 days. For particulars, address Bureau of Reclamation, Building 53, Denver Federal Center, Denver, Colorado.

VACANT POSITION

C. A. LA ELECTRICIDAD DE CARACAS, supplying electric light and power service to the city of Caracas, capital of the Venezuelan Republic, is interested in obtaining the following technical services:

a) CONSULTING ENGINEER: For Electrical Distribution Department.—Experience in public utility companies for cities of more than 500,000 inhabitants is required, as well as excellent recommendations.
Approximate salary: $14,000.00 a year.

b) ELECTRICAL ENGINEER: With experience in projects and estimates for distribution systems. Approximate salary: $10,000.00 a year.

Please address inquiries to Dr. Ricardo Zuloaga, C. A. La Electricidad de Caracas, Marron a Pelota N° 8, Caracas, Venezuela.

CHIEF ENGINEER

For modern new high pressure steam electric generating plant in the Southwest area of the United States. Prefer graduate mechanical engineer, or equivilent, with adequate experience and qualifications to assume complete supervision of plant operation and maintenance. Good working conditions and opportunity for advancement. Preferred age 35 to 45 years. All applications will be acknowledged. Salary commensurate with qualifications. Please send personal record to

P-4185, Electrical World
520 N. Michigan Ave., Chicago 11, Ill.

FOR SALE
MILL TYPE PEDESTRAL BEARING WOUND ROTOR MOTOR

800 H.P. 300 RPM 3 Phase 60 cycle 2300 volt (will connect 440 V) Allis Chalmers—Serial 111870—Type Any Rebuilt & Guaranteed 50% New Cost.

INDUSTRIAL ELECTRIC & SUPPLY CO., INC.
P. O. Box 1308 62 Auction Ave. Memphis, Tennessee

FOR SALE: 1 Frequency Converter, Model 16E128, Type 1TY803, 15 KW, 1800 RPM, Form SL #3263862—Pri 3 PH Cycles 60 Amps. 34/27—Volts 220/440, Sec. 3 PH Cycles 120 PF. 8 Amps 48—Volts 225—KW 15 with G.E. Induction Motor Model 5K324B2 Volts 220/440 Amps 24-8/12-4.

If interested contact B. L. Downs.

THE E. INGRAHAM CO.
BRISTOL, CONN.

OPERATING ENGINEERS AND ASSISTANT OPERATORS

For modern new high pressure steam electric generating plant in Southwest area of the United States. Applicants must have had at least five years of operating experience in high pressure steam turbine plant. Good working conditions and opportunities for advancement. Preferred age 25 to 45 years. All applications will be acknowledged. Please send personal record to

P-4182, Electrical World
520 N. Michigan Ave., Chicago 11, Ill.

FOR SALE

250 Miles of 44 KV Pole Line Hardware, Pin Type Insulators & Pins.
1 Lot 44 KV Bus Insulators.

TRANSFORMERS

6—100 KVA, G.E., 1 ϕ, 44000-2300 V.
9—100 KVA, Moloney, 1 ϕ, 44000-2300 V.
4— 50 KVA, Moloney, 1 ϕ, 44000-2300 V.
10— 10 KVA, 1 ϕ, 2400—120/240 V.
27—7½ KVA, 1 ϕ, 2400—120/240 V.
28— 5 KVA, 1 ϕ, 2400—120/240 V.
25— 3 KVA, 1 ϕ, 2400—120/240 V.
20—1½ KVA, 1 ϕ, 2400—120/240 V.

Alabama Electric Cooperative, Inc.
Andalusia, Alabama

WANTED FOR CASH

ELECTRIC MOTORS — STARTERS
TRANSFORMERS — OIL & AIR BRKRS.
WIRE — CABLE — WIRING MATERIALS
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ALLIED ELECTRIC & MACHINERY CO.
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Memphis, 1, Tenn.

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No lengths too long or too short
Telephone: Eastgate 7-4778

PIERCE CABLE CO.
2670 Clybourne Ave. Chicago 14, Illinois

SUBSTATION EQUIPMENT

TRANSFORMERS

Qu.	KVA	MFR.	VOLTAGE
4	500	Pitts.	66000/33000—13200/23000 Y
3	333	G. E.	69300—2400/7200
3	500	Pitts.	66000—2300
3	75	A. C.	66000/34000—7200/12470 Y
3	200	West.	45000—2400/7200
3	100	G. E.	44000—2300
3	75	West.	44000—7200/12470 Y
3	8333	West.	43800—13900
3	5000	G. E.	38100/66000—6600
1	18750	A.B.B.	34840—11000, 3 ph.
2	900	G. E.	33000—2300, 3 ph.
4	200	A. C.	34500—6900/11950
4	200	G. E.	34500—230/460
3	100	West.	33000—240/480 NEW
3	75	Wag.	33000—7200/12470 Y
4	450	A. C.	25410/44000—13980/23000
6	100	G. E.	22000—7200/12470 Y
9	50	G. E.	22000—2300
3	37½	G. E.	22000—6900
6	200	G. E.	13200—2300
3	900	G. E.	13200—230/460
4	750	G. E.	11000—440
3	250	Pitts.	7200—220/440
3	150	Wag.	6900/2300
3	37½	G. E.	6900—230/460
2	100	G. E.	4800/2400—480/240
3	1500	A. C.	2300/4000 Y—2300
3	333	G. E.	2300—230/460
1	100	G. E.	2300—575, 3 ph.
3	100	West.	2300—460/230
3	75	Mol.	2400—120/240
6	50	West.	2400—114/228 Dry Type

INDUCT. REGULATORS—OUTDOOR

1—140 KVA G. E. 200 A. 4000 V. 3 ph.
4—60 KVA West. 250/500 A. 2400 V. 1 ph.
6—48 KVA G. E. 500 A. 2400 V. 1 ph.
8—36 KVA West. 150/300 A.
2—36 KVA G. E. 75/150 A. 4800 V. 1 ph.

CIRCUIT BREAKERS

1—600 A. 73 KV G. E. FHKO-236-500 MVA
1—400 A. 37 KV G. E. FHKO-236-500 MVA
1—1500 A. 15 KV G. E. FKO-179-350 MVA
1—600 A. 15 KV G. E. FKO-139-350 MVA
1—600 A. 15 KV G. E. FHKO-136-1338-25
2—600 A. 15 KV G. E. FLO-15-240 MVA

BREW, WOLTMAN & CO., INC.
52 Church St. New York 7, N. Y.

FOR SALE

1—Allis-Chalmers 500 KVA Transformer 60 cycle, 3 phase, 4000-480 volts non-burnable liquid filled.

ALSO

3—Westinghouse 200 KVA Transformers 60 cycle, single phase, 2400/4160Y and 240/480 volts, oil filled.

These transformers in good condition and available for immediate delivery.

American Hoist & Derrick Company
W. R. Sprague—*Purchasing Agent*
63 South Robert Street
St. Paul 1, Minnesota

NEED DIESEL-GENERATOR?

QUICK ACTION REQUIRED
CONSIDER BEST OFFER

Must move 1140 hp—1000 kva 2400 volt Baldwin-DeLaVergne-Elliott Unit. Noted for ability to burn boiler oil. Complete with all auxiliaries. Need space for larger unit to be installed. May be seen running along with 2 other duplicates which we plan to retain in Grand Haven, Michigan Municipal Power Plant.

BOARD OF PUBLIC WORKS
City Hall Grand Haven, Mich.

WORLD'S LARGEST INVENTORY

P. O. BOX 51, ROCHESTER 1, N.Y.

FROM AVAILABLE STOCK

TURBO GENERATORS

Qu	KW	Make	Desc.
1	—6000	Al. Ch.	Condensing 300/250 I.S.P. 2300 v 2/60 Exc. & Surf cs Cond.
1	—750	G.E.	Condensing — 425 lbs. 750 T.I. I.S.P. 440 v. 3 ph. 60 cy.— Built 1944
1	—80	Moore	Non-condensing. 180/200 lbs. I.S., 8/35 lbs. G.B.P. 3 60/480 volts Direct Connected Exciter
1	—100	Westg	Non-condensing — 135/150 lbs. I.S.P. 5/10 lbs. B.P. — 240/480 v. 3 ph. 60 cy.
1	—300	G.E.	Non-co densing 150/175 I.S.P. 5/10 B.P.— 480 v. 3 ph. 60 cy.

SYNCHRONOUS CONDENSERS

KVA	Make	Type	Volts	Speed
1—5000	Whse		2400/4160	600

MOTOR GENERATOR SETS

3 ph. 60 cy.

Qu	KW	Make	Speed	DC Volts	AC Volts
1—	2500	G.E.	300	600 35 cy.	11000
1—	1500	G.E.	720	600	12000
1—	1000	G.E.	900	275	2300/4600
1—	1000	G.E.	900	300	4160 6600
1—	1000	G.E.	900	600	2300/4160
1—	1000	G.E.	900	600	2300/4160
2—	1000	Whse.	900	600	2300/4160
1—	500	Whse.	900	250	6900/12000
1—	500	Whse.	1200	125/250	2300
1—	500	Whse.	900	250	440
1—	400	G.E.	720	125	2300
1—	400	G.E.	720	125	440/250
1—	400	G.E.	900	125	4160
1—	250	G.E.	1200	125	2300
1—	150	G.E.	1200	275	2300
1—	150	Whse.	1200	275	2300

TRANSFORMERS—60 Cycle

KVA	Make	Type	Ph	Voltages
1—1250	G.E.	RVDDJ	3	6600x550
3—1250	G.E.	HT	3	2300-/12000x4160/2300
1—1150	A.C.	OISC	3	13800x460/2400
2—1000	G.E.	RVDDJ	1	2200x480
3—500	A.C.	OISC	1	11500x8800
5—500	G.E.	HT	3	24000x2400/480

BELYEA

COMPANY, INC.

OFFICE & SHOP
51 Howell St., Jersey City 6, N. J.

DIESEL POWER

FOR

IMMEDIATE SHIPMENT

UNIT CAPACITIES—10 TO 1875 KVA

A.C.—50 AND 60 CYCLES

VARIOUS VOLTAGES

A PARTIAL LISTING OF OUR INVENTORY

KW	Make	Model	HP	RPM	KW	Make	Model	HP	RPM
1125	Fairbanks Morse	38D	1600	720	320	Enterprise	DSG-6	600	600
1100	General Motors	16-278A	1600	720	300	General Motors	8-268A	450	1200
750	General Motors	12-567	1080	720	200	General Motors	6-268A	300	900
600	General Motors	8-278A	750	720	160	General Motors	4-268A	150	1200
500	General Motors	8-567	720	720	100	Worthington	BB-8	150	600
350	Baldwin	VO-6	510	450	60	General Motors	6-71	90	1200
350	Buckeye	80	460	600	50	Internat'l Harvester	UD-14	45	1200

D.C. UNITS ALSO AVAILABLE

A. G. SCHOONMAKER COMPANY, INC.
ENGINE DIVISION, 50 CHURCH ST., NEW YORK 7, N. Y.

J. L. HEMPHILL & CO.

ELECTRICAL ENGINEERS & EQUIPMENT

TRANSFORMERS

1—1500 KVA G.E., 3 Ph., 4150V, 2300V Pyranol
1—1500 KVA Penn. 3 ph., 4160V, Y 2400V Delta
2— 400 KVA Pitts., 1 Ph., 2400/4800V prt. 240/480V sec.
1— 200 KVA G.E., 3 Ph., 2400-220 Exc.
3— 100 KVA Wagner, 1 Ph., 240V prt., 120V sec.
6— 50 KVA G.E., 1 Ph., 13,450V. 120/240 Sec.

SYNCHRONOUS MOTORS

1— 300 H.P., Elec. Mach. 720 RPM, 3 Phase 60 cyc., 2300V T E F Coated Outdoor service.
1— 150 H.P., G.E., 1200 RPM, 220V.
2— 150 H.P., Al. Chal. 360 RPM, 440V.

MOTOR GENERATOR SETS

1—1000 KW G.E., 600 V. 514 RPM, 4000V 60.
1— 300 KW Whse., 275V. 900 R.P.M., 220 V 3ph.
1— 175 KVA Westi., 1 Ph., 220V. Motor 3 Ph., 440V.
1— 150 KW. G.E., 125/250V. 1200 RPM, 2300 3ph
1— 100 KW G.E., 250V. 900 RPM, 2300V. 3ph.
1— 75 KW C.W. 250V. 1200 RPM. 2300/3150V 3ph.

SLIP RING MOTORS

1— 200 H.P., West. CW. 600 RPM. 440V.
1— 250 HP West., CW. 600 RPM. 440V.

SYNCHRONOUS CONDENSER

1—200 H.P. West. CW. 600 RPM. 440V.
1—2500 KVA Whse., 720 RPM. 2250V with DC EXC.

Large Stock of A.C. and D.C. Equipment

TRANSFORMERS

BOUGHT AND SOLD

We carry a large stock of transformers, and invite your inquiries. New Transformers built to your specifications.

PIONEER TRANSFORMER REBUILDERS

We rewind, repair and redesign all makes and sizes. One Year Guarantee.

THE ELECTRIC SERVICE CO., INC.
"AMERICA'S USED TRANSFORMER CLEARING HOUSE"
SINCE 1912 CINCINNATI 27, OHIO

LETTERS TO THE EDITOR

Another Job for ASA

To the Editor:

In your Technical Notes of April 14 it was suggested, that besides "Megakilowatthour" the word "Trega" should be used, if it means "billion."

I believe this suggestion would bring mistakes if it were used, especially by European readers.

There are already existing standard definitions, and I believe it will be useful to publish them:

Tera (T)	$= 10^{12}$	Dezi (d)	$= 10^{-1}$
Giga (G)	$= 10^{9}$	Zenti (c)	$= 10^{-2}$
Mega (M)	$= 10^{6}$	Milli (m)	$= 10^{-3}$
Kilo (k)	$= 10^{3}$	Mikro (u)	$= 10^{-6}$
Hecto (h)	$= 10^{2}$	Nano (n)	$= 10^{-9}$
Deca (D)	$= 10^{1}$	Pico (p)	$= 10^{-12}$

I am sure the noted figures could be expressed also as simple by above use of standard definitions.

Ferdinand H. Spitaler
Stuttgart-Süd
Strohberg 39, Germany

• Maybe the American Standards Association can settle this problem of semantics.

No BPA Rate Cut

To the Editor:

I note that on page 63 of the June 30 issue of Electrical World I am quoted as saying to the Washington Public Utility Commissioners Association that a reduction in Bonneville power rates in 1954 is a distinct possibility. I did not speak from a written text and therefore do not have an exact transcript of my remarks. However, I have checked with others present at the meeting in Richmond, Wash., and have so far been unable to find anybody who gained the impression given in your article.

I think probably the comment leading to this misinterpretation was my statement that if all of our accumulated surplus, estimated at about $70 million to $80 million in 1954, were applied to a reduction in rates during the five-year period 1954 to 1959 it would amount to about $15 million per year and would eliminate necessity for a rate increase in 1959 or might even make possible a reduction in rates. The possibility that all of the surplus would be applied in that way during a single five-year term is of course very remote. Therefore, to interpret my conditional statement as saying that there is a distinct possibility that our rates may be reduced in 1954 is an entirely unfounded conclusion.

I have stated at meetings many times over the past several years that it is quite likely that our rates will be increased somewhat in 1954, and this situation has not changed.

I was not particularly flattered to have my name listed as Dittmeyer, but those things I suppose do happen . . .

Wm. A. Dittmer
Power Manager
U. S. Department of the Interior
Bonneville Power Administration
Portland 8, Ore.

5-Amp C. T. Preferred

To the Editor:

Your editorial "One Ampere Current Transformer," in the Electrical World for October 22, 1951, suggests that copper savings could be made in long secondary runs from current transformers if one-ampere, rather than five-ampere, secondary current rating were used. As a result of a previous editorial on this subject in 1944, a Working Group of the AIEE Relay Subcommittee studied this proposal and their findings were published in Electrical Engineering and in AIEE Transactions 1946, P. 649.

Although the situation with regard to the scarcity of copper is much more severe now than it was in 1946, the conclusion reached by the committee is still valid today. This conclusion was that the one-ampere secondary idea has more disadvantages than advantages, and it should not be adopted as an industry standard. Among the disadvantages cited were the extra insulation required for the higher voltages to be encountered, particularly during overcurrent and open-circuit secondary conditions, and the vast amount of development required to make relays and other devices suitable for one-ampere operation.

At the present time, the small saving in copper that might be achieved in those few installations where long secondary runs are involved is more than outweighed by the large amount of technical manpower that would be required to redesign current transformers, relays, and associated devices for one-ampere service. The shortage of technical manpower is just as severe as the shortage of copper, and this one fact alone would seem to rule out any change at this time.

It is the opinion of the Instrument Transformer Group of NEMA that industry standards should not be changed from the present five-ampere secondary current, and that those few instances where long secondary runs are unavoidable can be treated individually in whatever manner seems best for the particular application.

M. T. Banks, Chairman
Instrument Transformer Group
National Electrical
Manufacturers Association
New York 17, N. Y.

Wire Rope Cutter

To the Editor:

We are interested in obtaining a new wire rope cutter, called Series 15 Guillotine, advertised in the New Equipment Section of Electrical World of June 30, page 116.

As the manufacturer of this equipment is not indicated, will you please send us this information.

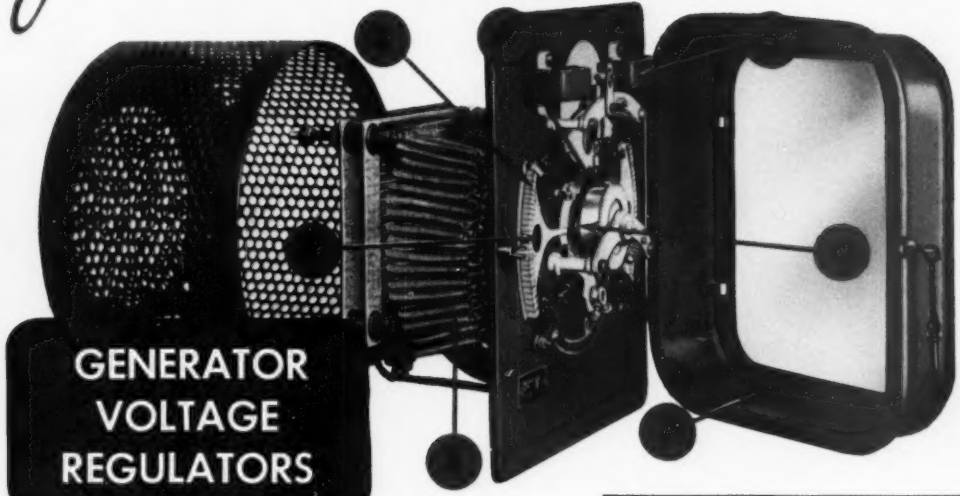
G. H. R. Sissons
Electrical Superintendent
Price Brothers & Co, Ltd
Riverbend, Quebec, Canada

• It's made by Manco Mfg Co, Bradley, Ill.

We're Moving to Bigger Quarters

Beginning Aug. 11 this department will appear elsewhere in the book. It won't be hard to find if you will use the "Contents Page" to locate us. The new location will provide "growing room." With only one page we have been unable to print your letters as quickly as we would like. We shall continue our policy of printing the best letters submitted—those of most interest to our readers and those which comment constructively on our editorial content.

Get Rocking Contact



GENERATOR VOLTAGE REGULATORS

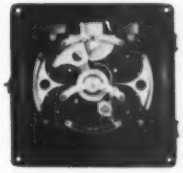
With these 7 Features:

- **RESISTORS** are matched to the characteristics of your machine . . . are cut in and out of the exciter shunt field by the *Rocking Contact* sector.
- **SECTOR RIM,** of hard graphite, rocks on the silver-surfaced commutator. This eliminates contact build-up without polarity reversing circuits.
- **COMMUTATOR** is curved so that small sector movement gives quick response.
- **MOTIVE ELEMENT** driving contact sector is fast acting—because of its low inertia design.
- **DAMPING MECHANISM** has no electrical circuits . . . is self-contained.
- **JEWELED BEARINGS** reduce friction, improve sensitivity.
- **DUST-TIGHT COVER** seals out dirt . . . assures lasting accuracy.

Designed for panel mounting, every *Rocking Contact* Regulator has an instrument-like appearance. Select the one that fits your needs. For further information, call your A-C representative, or write Allis-Chalmers, Milwaukee 1, Wisconsin. A-3762

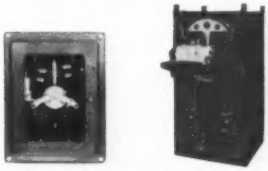
Rocking Contact is an Allis-Chalmers trademark.

ALLIS-CHALMERS

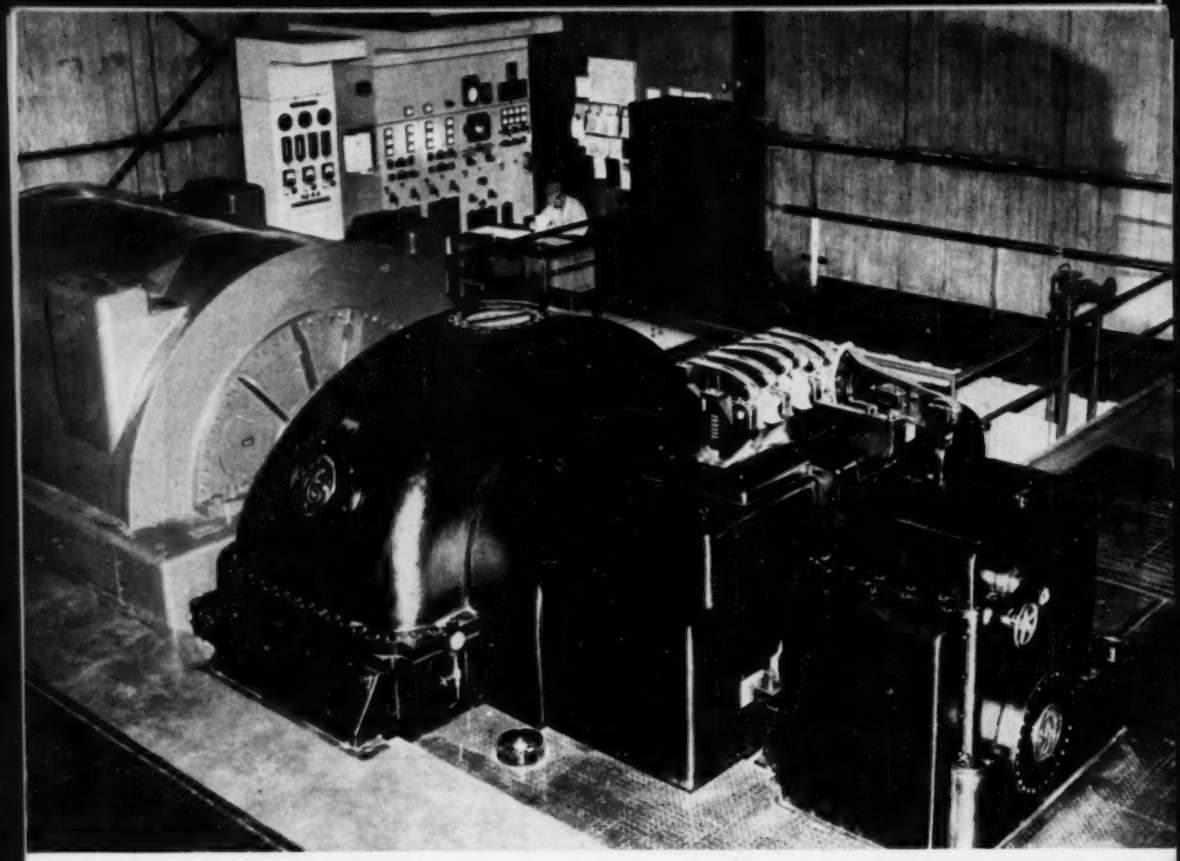


TYPES A, B, and C (shown in detail above) are applied to ac generators from 125 kva at 257 rpm to 25,000 kva at 3600 rpm. Get Bulletin 14B6035.

TYPES V-00 and 221 Regulators are applied to ac generators from the smallest up to 438 kva at 3600 rpm. Bulletin 14B6143A describes them.



TYPE J, for larger machines, consists of two parts: motor-operated *Rocking Contact* rheostat and a panel-mounted control element. Bulletin 14B6015.



Assures trouble-free lubrication for life of new turbine

There is good reason to believe that this new 15,000-KW turbine at Ottertail Power Company's Ortonville, Minnesota, plant will never have to be shut down for oil replacement, oil system cleaning, or because of oil acidity troubles. The basis for this conviction can be found in the company's own experience with NONPAREIL Turbine Oil, lubricant for the new unit.

Since 1931, the Ottertail Power Company has put NONPAREIL into several turbines. In one of those first units, NONPAREIL has now served for 21 years, and the original fill of oil has never needed to be replaced. Although the lubricant has not been removed for treating, it has maintained a neutralization number below 0.09 mg. KOH/gm. The oil system has not required cleaning.

With this evidence of long life is the written guarantee given with each fill of oil that NONPAREIL will last as long as the turbine and will maintain a neutralization number below 0.15 mg. KOH/gm.

You can assure trouble-free lubrication for the life of your turbines by using NONPAREIL Turbine Oil. Phone your Standard Oil Company (Indiana) office for the services of a Standard lubrication specialist. Or write Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

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TRADE MARK
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